YEAR 7 MATHEMATICS CHALLENGE

Heat 4, via *Livestorm*

Wednesday 8th March 2023

William Thallon, Secondary Mathematics Adviser

David Cook, Lead Primary Mathematics Adviser

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

FOUR HEATS AND A FINAL

This is the last of four heats.

The top 12 (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 Stevenage on Wednesday 19th April.

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. Haverbrook 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 a *Google* 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.

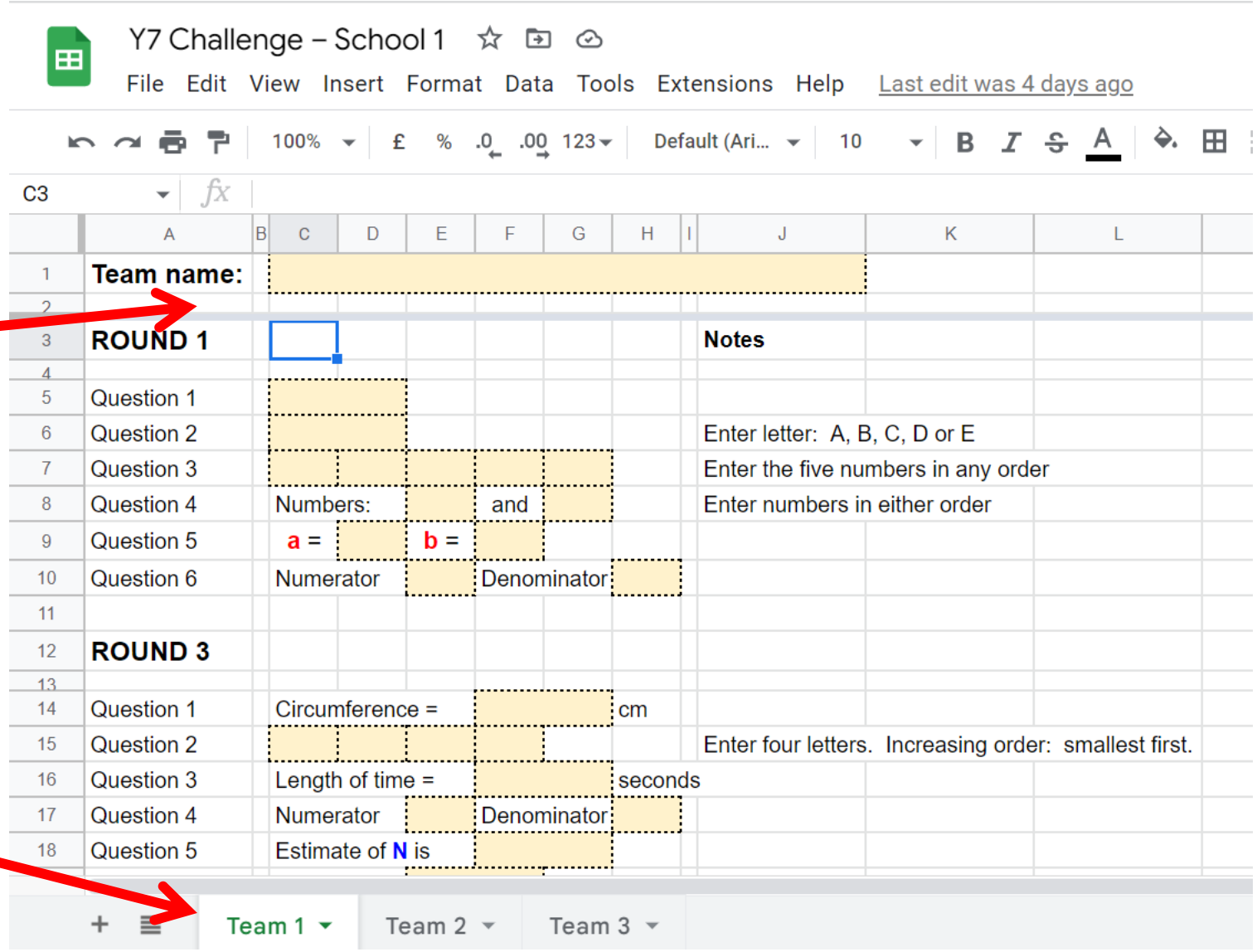
GOOGLE SHEET

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.)



Round 1

General Mathematics Questions

90 seconds for each question

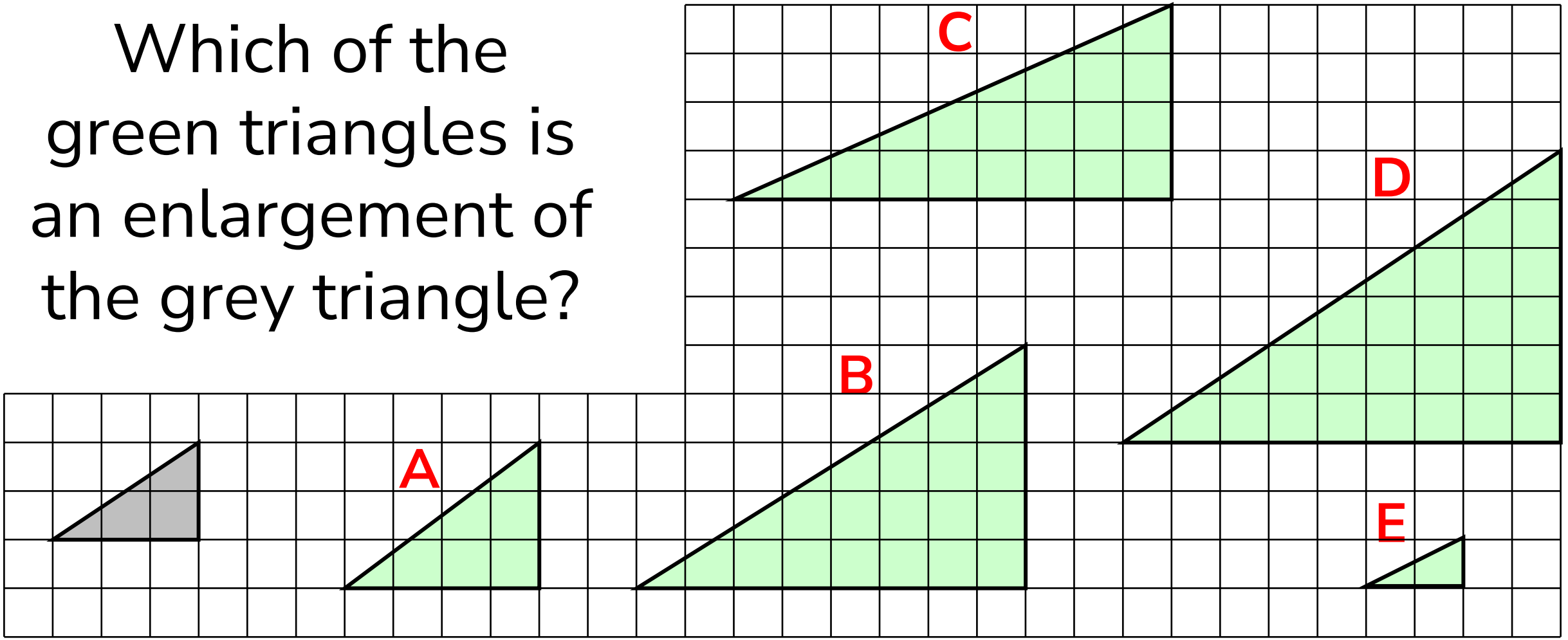
ROUND 1, QUESTION 1

50% of a number is 85.

What is 30% of the number?

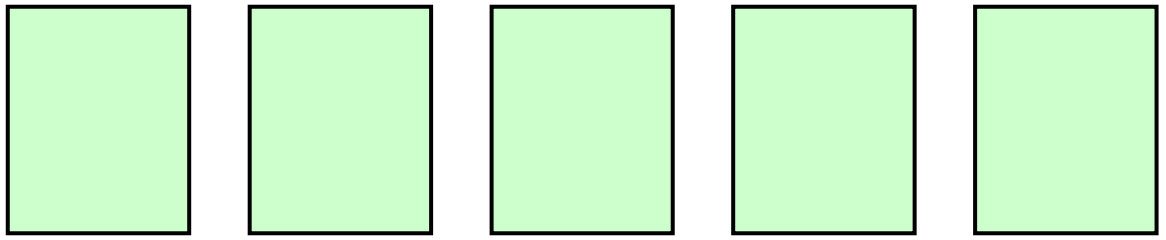
ROUND 1, QUESTION 2

Which of the green triangles is an enlargement of the grey triangle?



On the *Google* sheet, enter **A**, **B**, **C** ,**D** or **E**.

ROUND 1, QUESTION 3



Work out the five numbers which satisfy the following:

- Mode = **2**
- Median = **6**
- Mean = **9**
- Range = **17**

On the *Google* sheet, there are five spaces to enter the numbers. You may enter them in any order.

ROUND 1, QUESTION 4

What could this number be?

- It is an integer between 1 and 100 inclusive.
- It is a multiple of 14.
- It is 6 more than a square number.

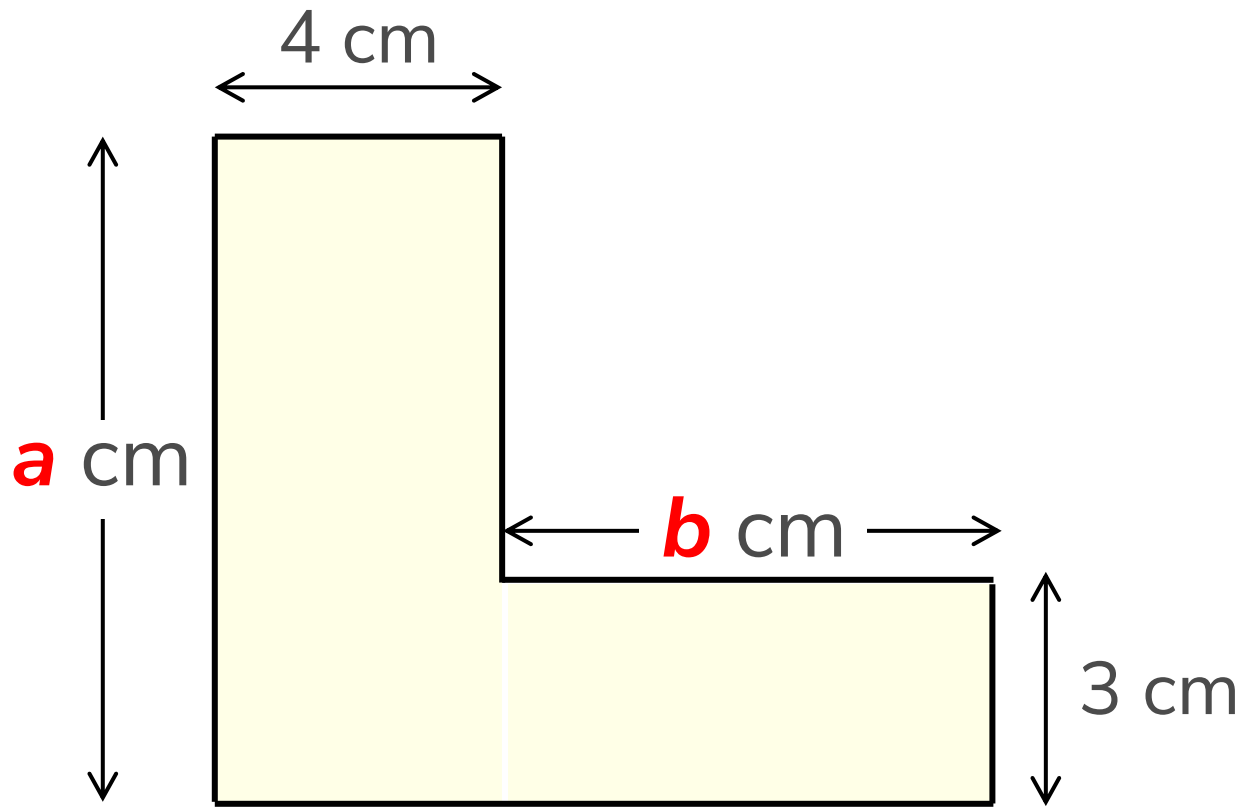
There are two possibilities.
Find them both.

On the *Google* sheet, you are invited to enter ‘Answer 1’ and ‘Answer 2’. Enter the answers in either order.

ROUND 1, QUESTION 5

The area of this L-shape is exactly 50 cm².

It is **not** drawn to scale.



Find possible values for lengths ***a*** and ***b***, in cm.

ROUND 1, QUESTION 6

Write down any fraction whose value is between $\frac{1}{5}$ and $\frac{1}{6}$.

There are separate spaces on the *Google* sheet for the numerator and denominator of your fraction.

End of Round 1

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

ANSWERS TO ROUND 1

ROUND 1, QUESTION 1

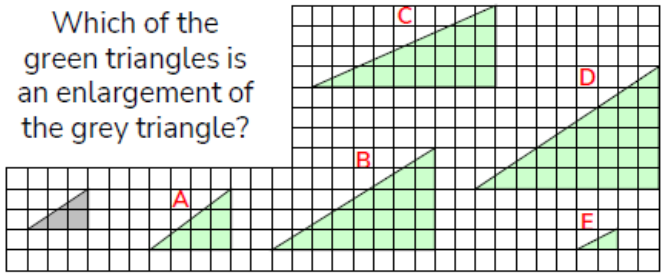
50% of a number is 85.

What is 30% of the number?

51

ROUND 1, QUESTION 2

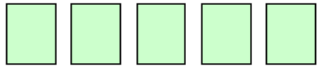
Which of the green triangles is an enlargement of the grey triangle?



On the *Google* sheet, enter A, B, C ,D or E.

D

ROUND 1, QUESTION 3



Work out the five numbers which satisfy the following:

- Mode = 2
- Median = 6
- Mean = 9
- Range = 17

On the *Google* sheet, there are five spaces to enter the numbers. You may enter them in any order.

2, 2, 6, 16, 19

ROUND 1, QUESTION 4

What could this number be?

- It is an integer between 1 and 100 inclusive.
- It is a multiple of 14.
- It is 6 more than a square number.

There are two possibilities.
Find them both.

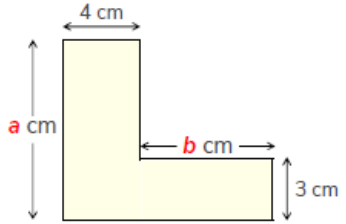
On the *Google* sheet, you are invited to enter 'Answer 1' and 'Answer 2'. Enter the answers in either order.

42 and 70

ROUND 1, QUESTION 5

The area of this L-shape is exactly 50 cm².

It is **not** drawn to scale.



Find possible values for lengths *a* and *b*, in cm.

$a = 8, b = 6$; or $a = 5, b = 10$

ROUND 1, QUESTION 6

Write down any fraction whose value is between $\frac{1}{5}$ and $\frac{1}{6}$.

There are separate spaces on the *Google* sheet for the numerator and denominator of your fraction.

e.g. $\frac{11}{60}, \frac{2}{11}, \frac{19}{100}$

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 **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 poster will be shown on the screen. The scribes 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

Scribes 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 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

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.

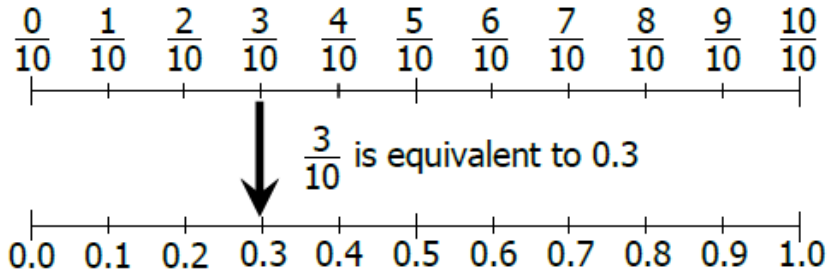
You now have one minute to decide who will be the observers and who will be the scribes … and to get into position!

ROUND 2

Poster about to be displayed for the first time.

Fractions and their equivalent decimals

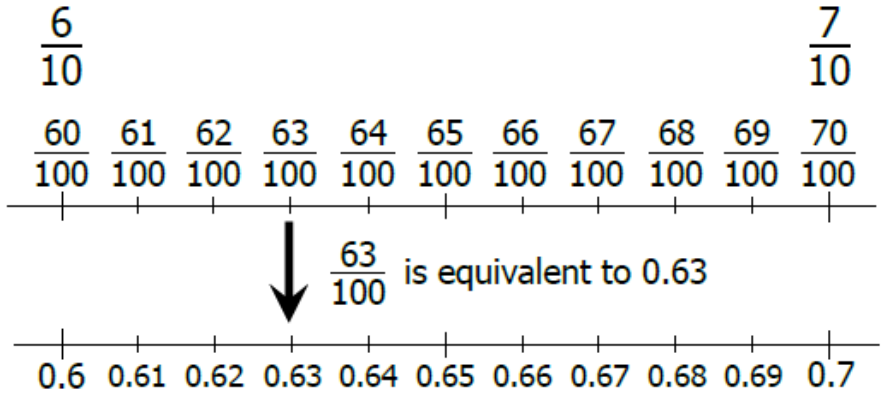
One decimal place



Fractions equivalent to any of these will also have one decimal place, for example:

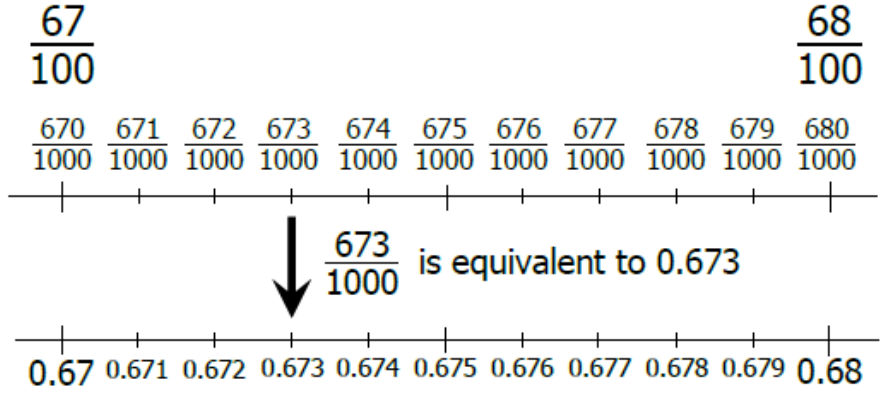
$\frac{1}{2} = \frac{5}{10} = 0.5$ $\frac{18}{30} = \frac{6}{10} = 0.6$ $\frac{28}{35} = \frac{8}{10} = 0.8$

Two decimal places



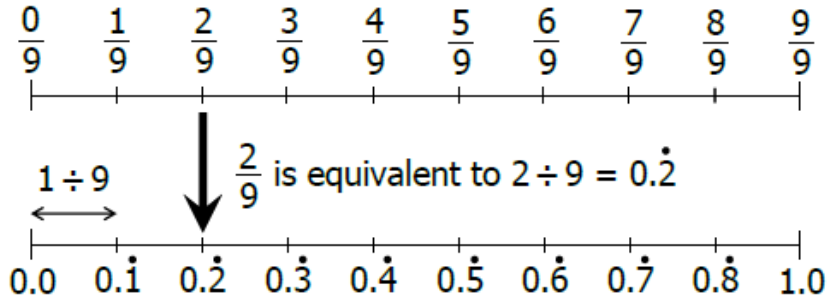
Other examples: $\frac{1}{4} = \frac{25}{100} = 0.25$ $\frac{41}{50} = \frac{82}{100} = 0.82$

Three decimal places



The simplest fraction with 3 d.p. is: $\frac{1}{8} = \frac{125}{1000} = 0.125$

Fractions whose decimals don't terminate



$$9 \overline{)\, 2.^{2}0\ ^{2}0\ ^{2}0\ ^{2}0 \ldots} \quad 0.2\,2\,2\,2\ldots$$

Round 2

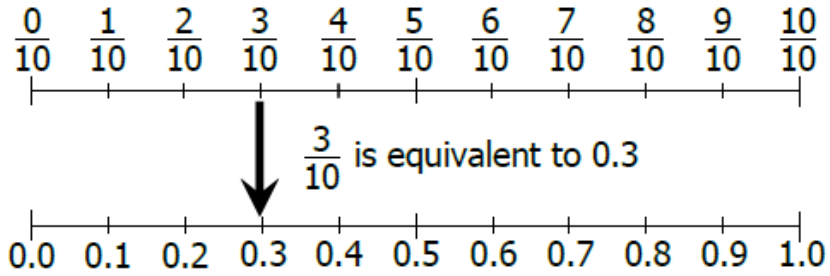
Memory Round

ROUND 2

Second viewing of poster coming up!

Fractions and their equivalent decimals

One decimal place



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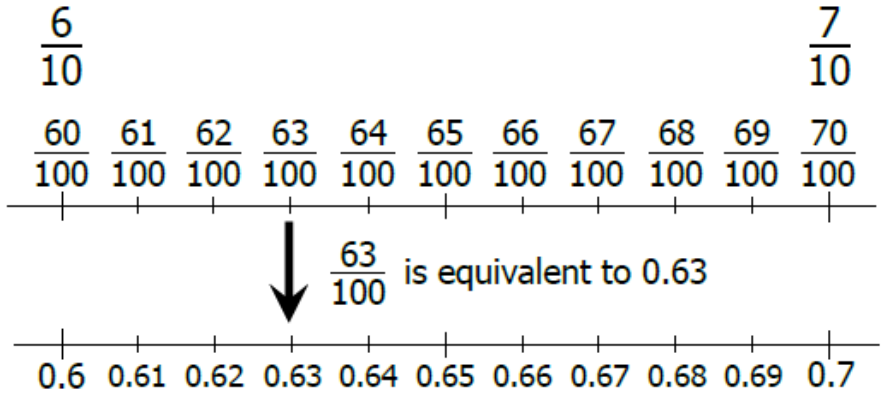
Two decimal places



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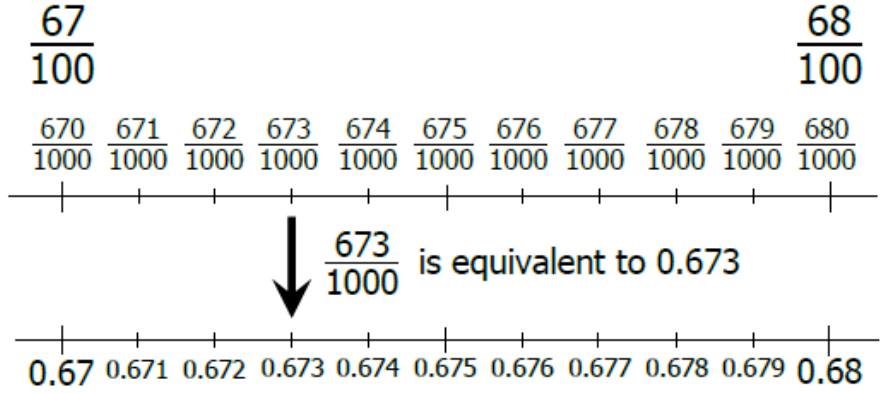
Three decimal places



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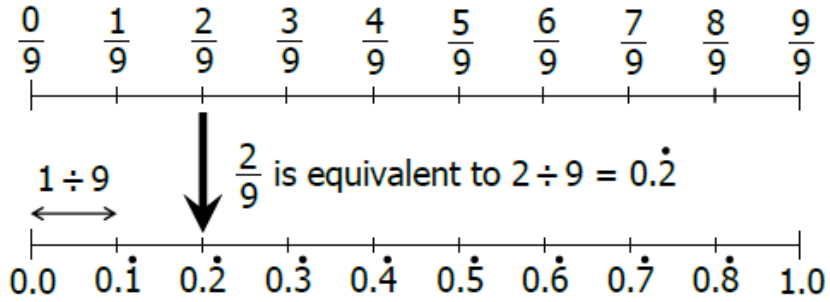


$$9 \overline{)\, 2.^{2}0\ ^{2}0\ ^{2}0\ ^{2}0 \ldots} \quad 0.2\,2\,2\,2\ldots$$

Round 2

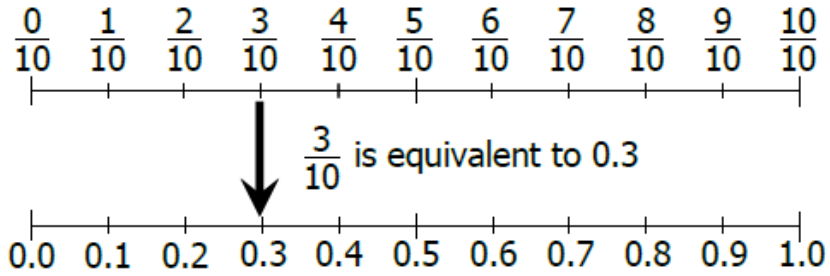
Memory Round

ROUND 2

Third viewing of poster coming up!

Fractions and their equivalent decimals

One decimal place



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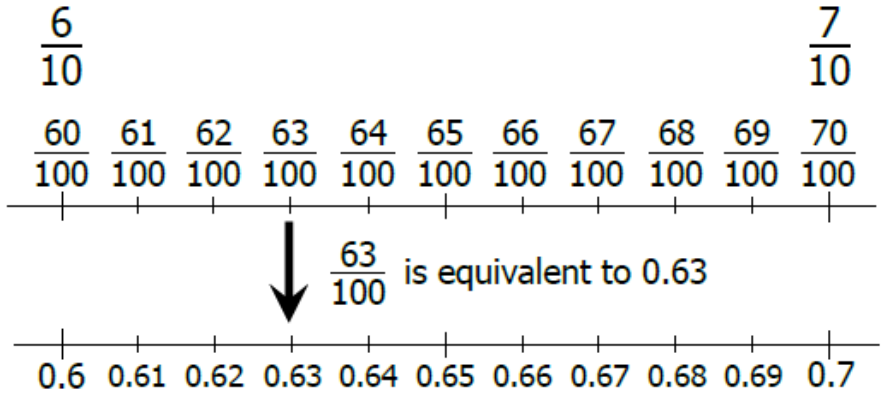
Two decimal places



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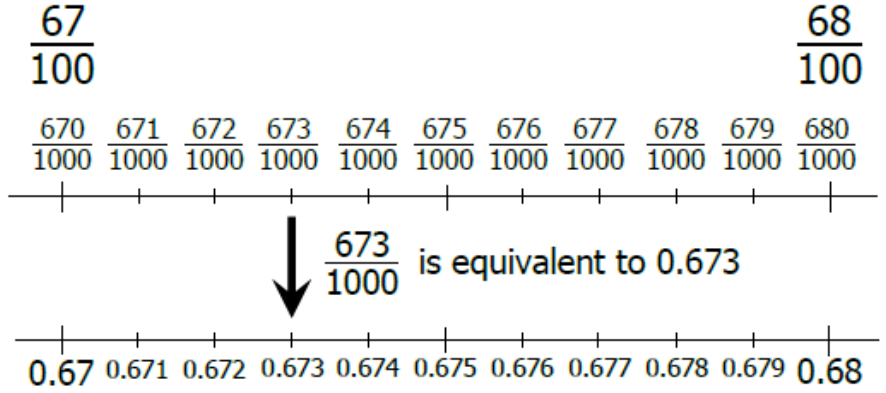
Three decimal places



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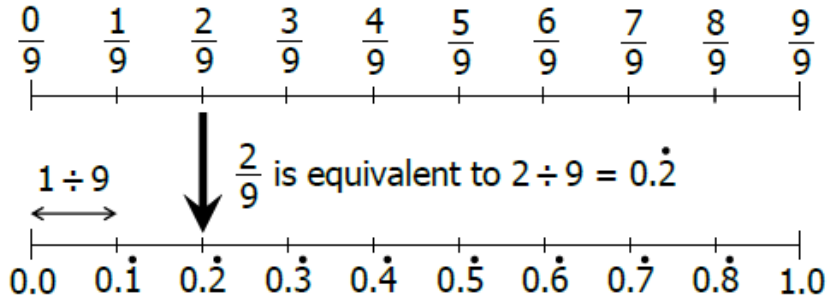
Fractions whose decimals don't terminate



$$9 \overline{)\, 2.^{2}0\ ^{2}0\ ^{2}0\ ^{2}0 \ldots} \quad 0.2\,2\,2\,2\ldots$$

Round 2

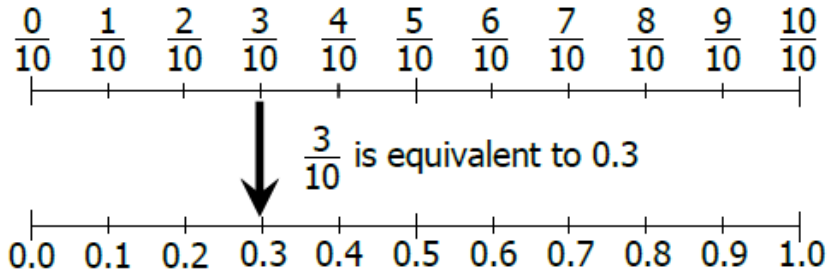
Memory Round

ROUND 2

Fourth and final viewing of poster coming up!

Fractions and their equivalent decimals

One decimal place



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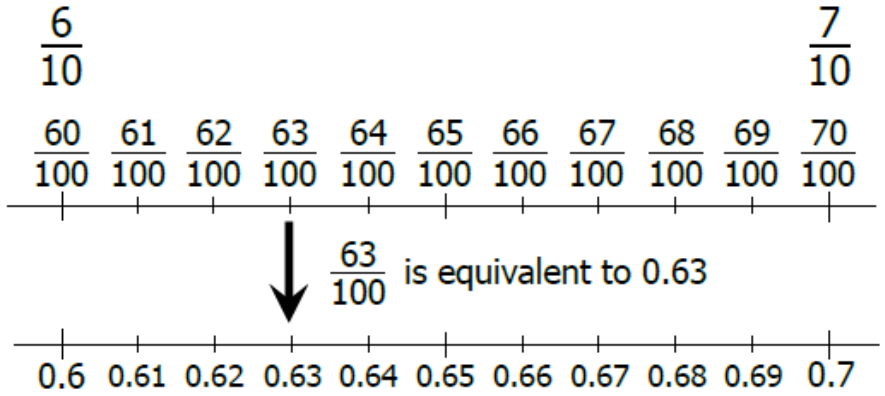
Two decimal places



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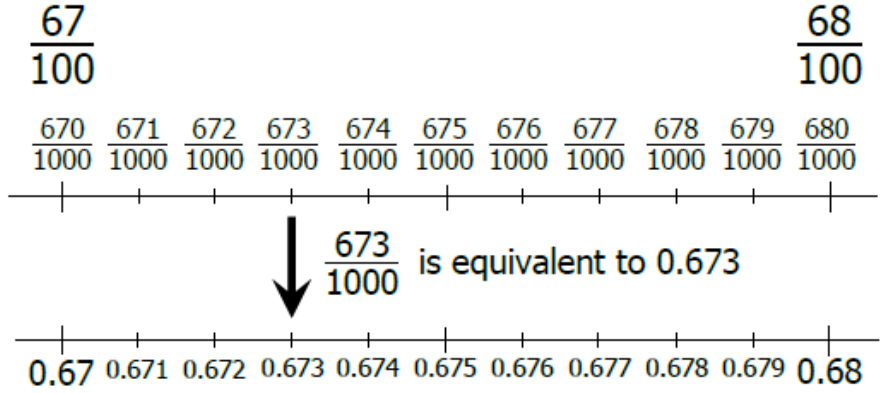
Three decimal places



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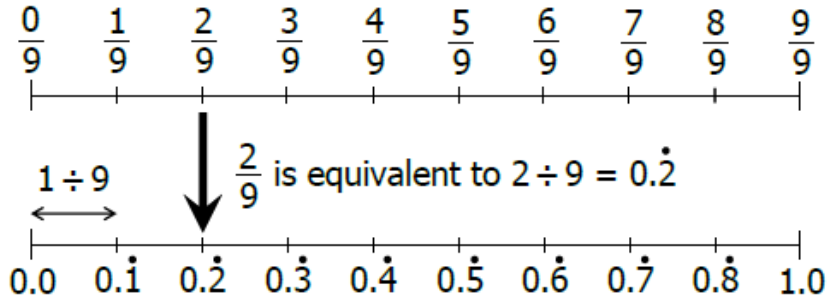


$$9 \overline{)\, 2.^{2}0\ ^{2}0\ ^{2}0\ ^{2}0 \ldots} \quad 0.2\,2\,2\,2\ldots$$

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:

david.cook@hfleducation.org

End of Round 2

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

david.cook@hfleducation.org

Round 3

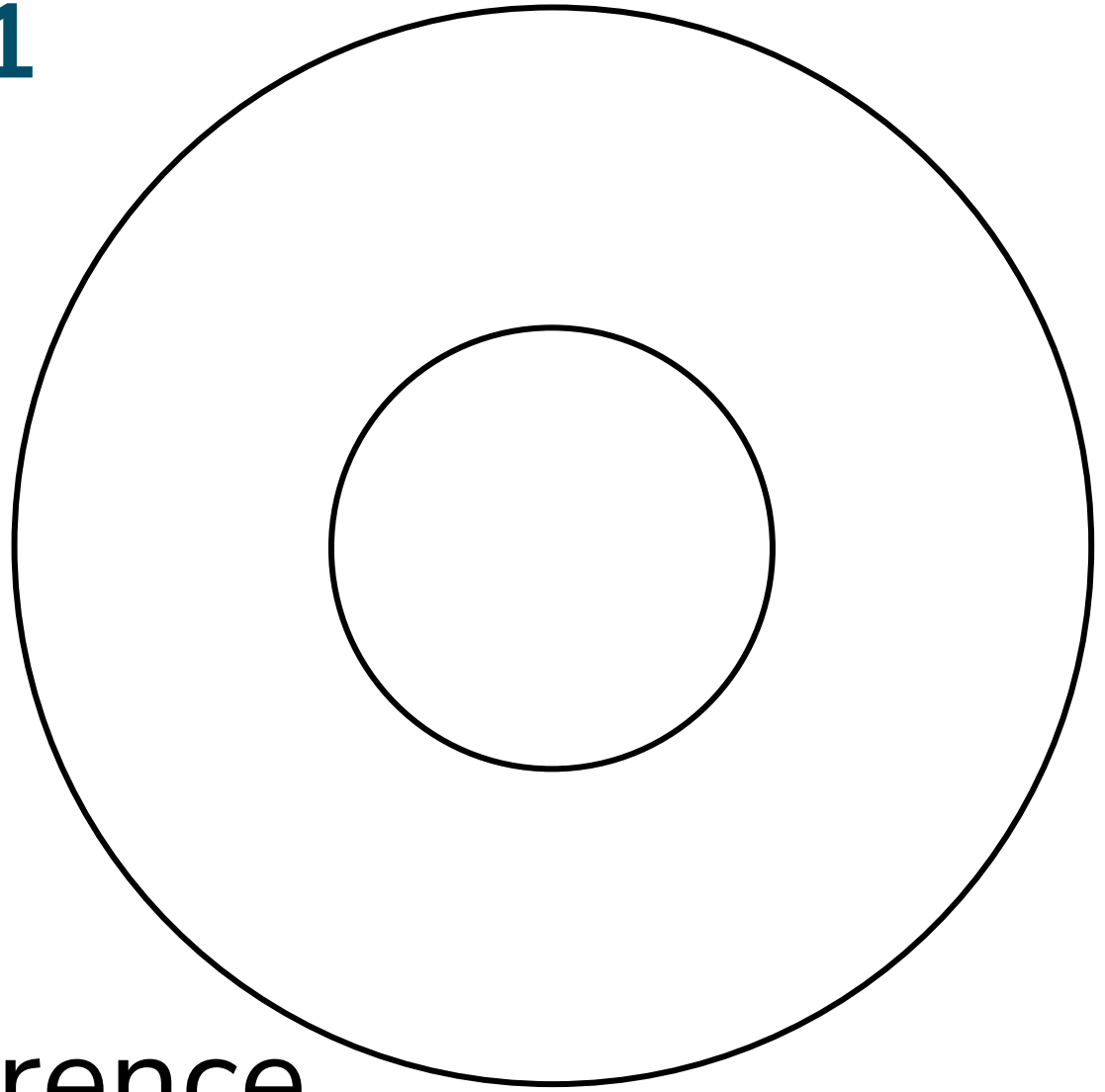
Estimation Round

90 seconds for each question

ROUND 3, QUESTION 1

Here are two circles, drawn to scale.

The circumference of the larger circle is 1 metre.



Estimate the circumference of the smaller circle, in cm.

ROUND 3, QUESTION 2

Arrange these calculations in increasing order of value, starting with the smallest.

P 71.3×96.4

Q $1{,}496.85 + 4{,}911.7$

R $4{,}172 \div 0.31$

S $0.215 \times 46{,}122$

On the *Google* sheet, write the four letters in the correct order, without spaces, e.g. **PQRS**.

ROUND 3, QUESTION 3

Estimate the length of time, in seconds, for which this picture appears on the screen.

ROUND 3, QUESTION 3

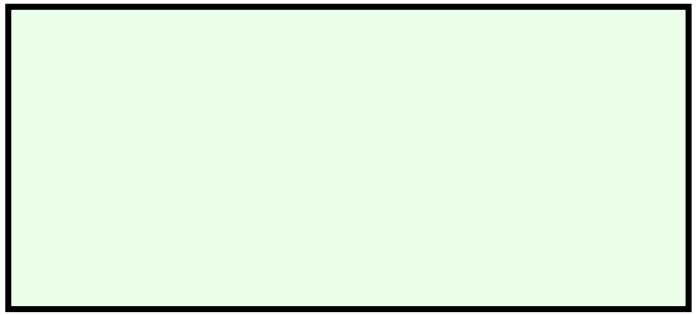
Decide on your estimate.

Question 4 coming up ...

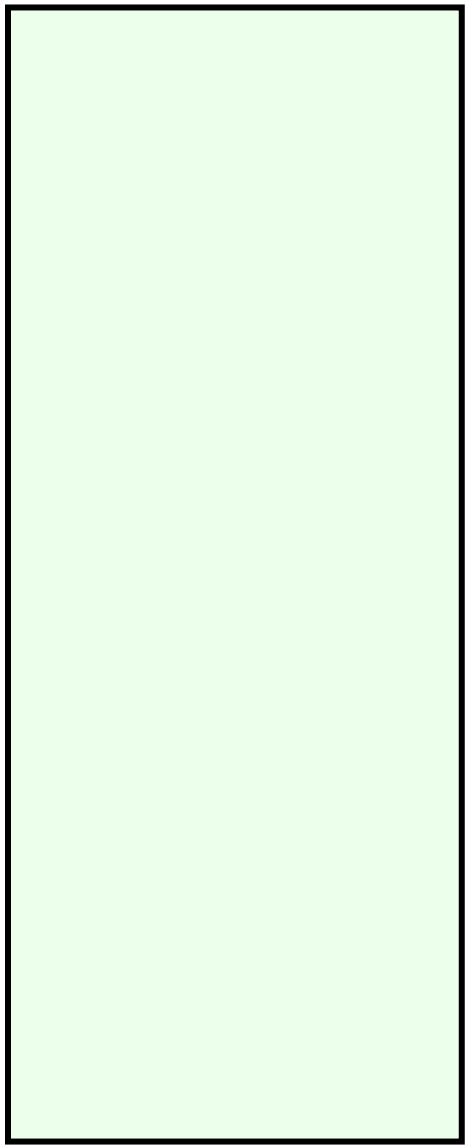
ROUND 3, QUESTION 4

A and **B** are rectangles.

A



B

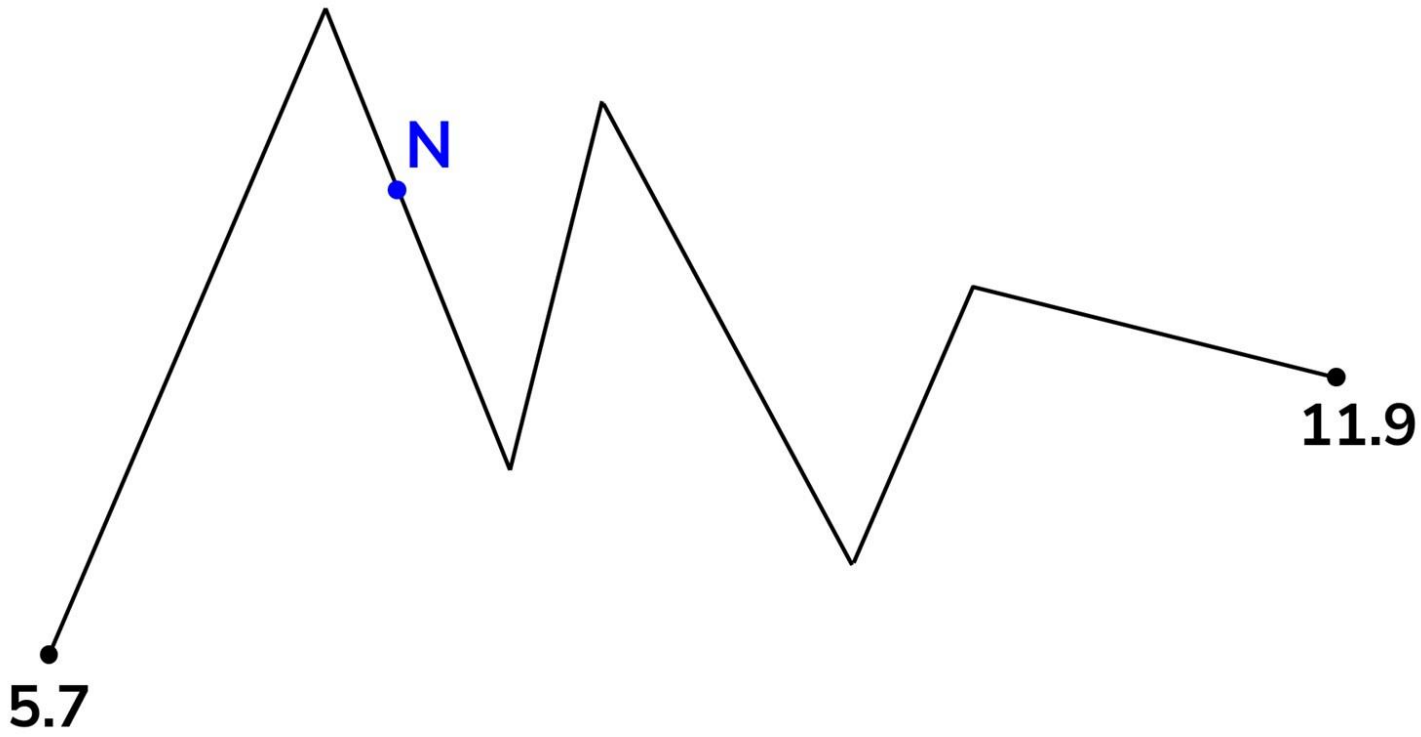


Estimate the area of **A** as a <u>fraction</u> of the area of **B**. The fraction must be in its simplest form.

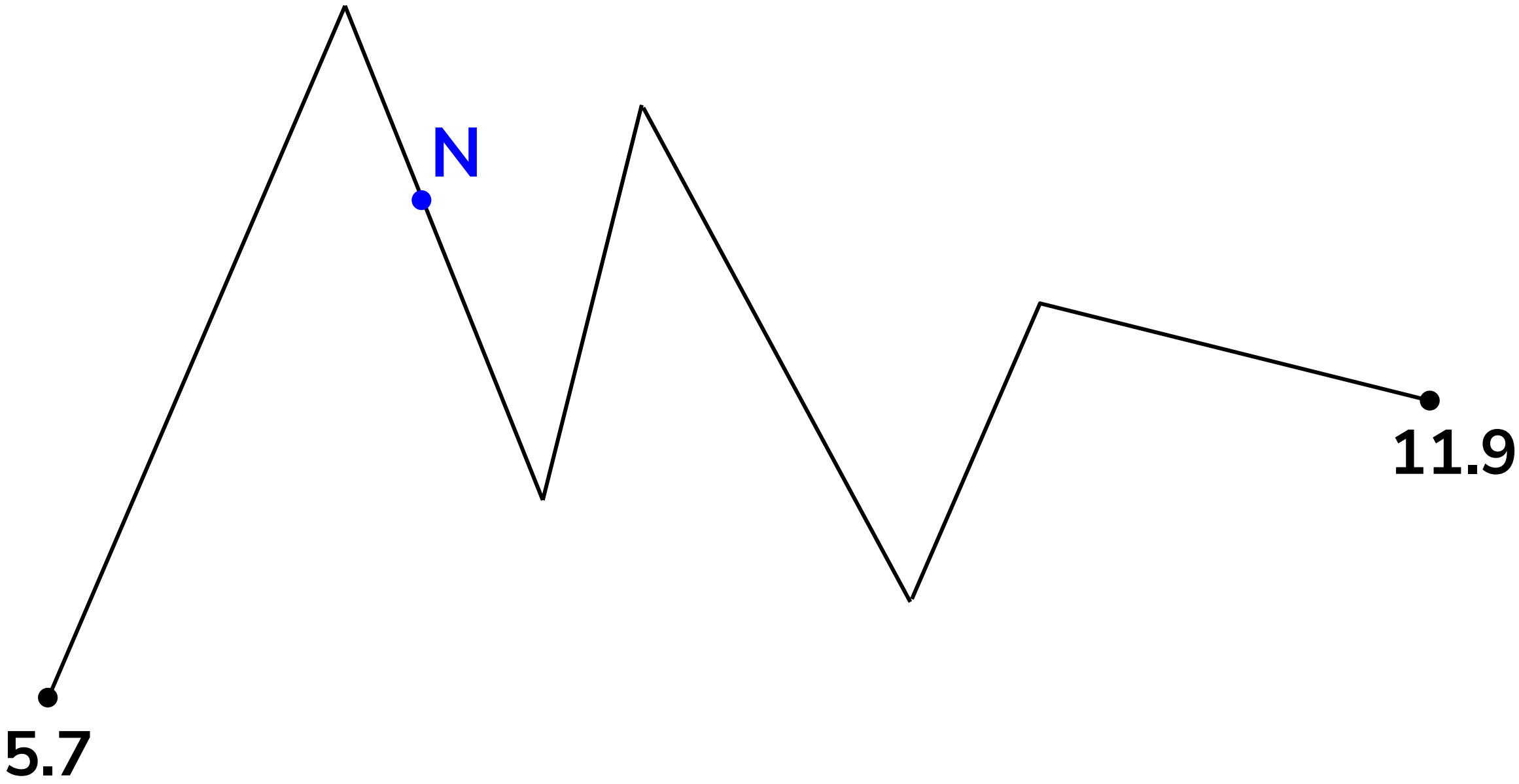
There are separate spaces on the *Google* sheet for the numerator and denominator of your fraction.

ROUND 3, QUESTION 5

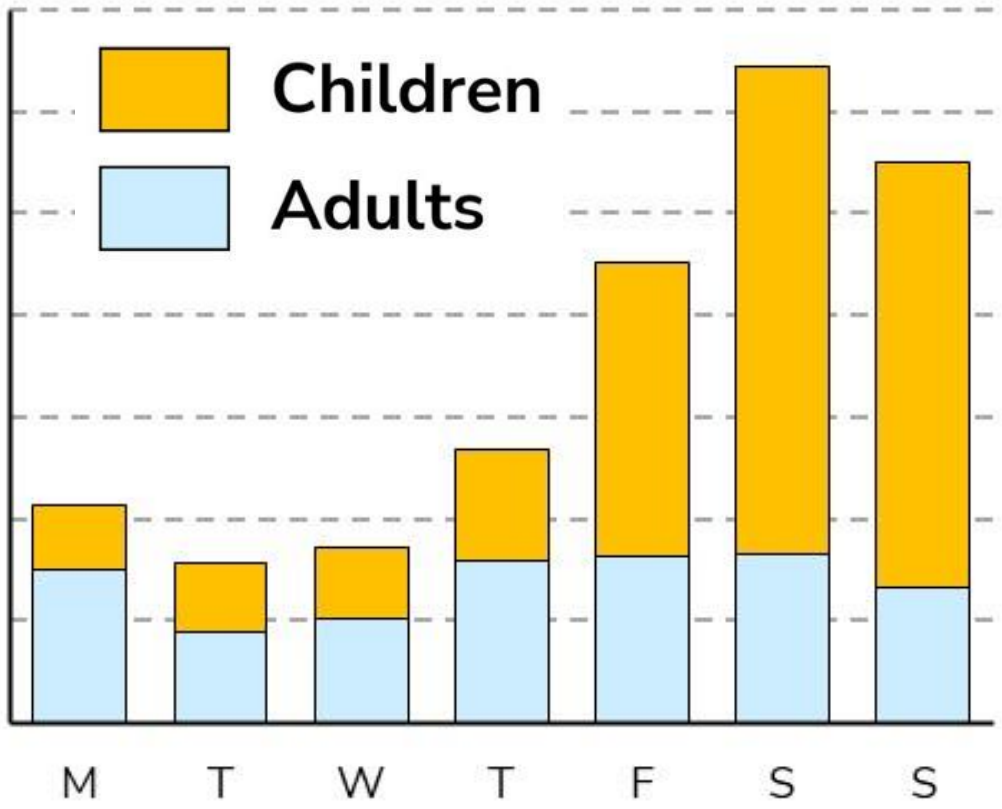
Estimate the number represented by the point **N** on this number line.



ROUND 3, QUESTION 5



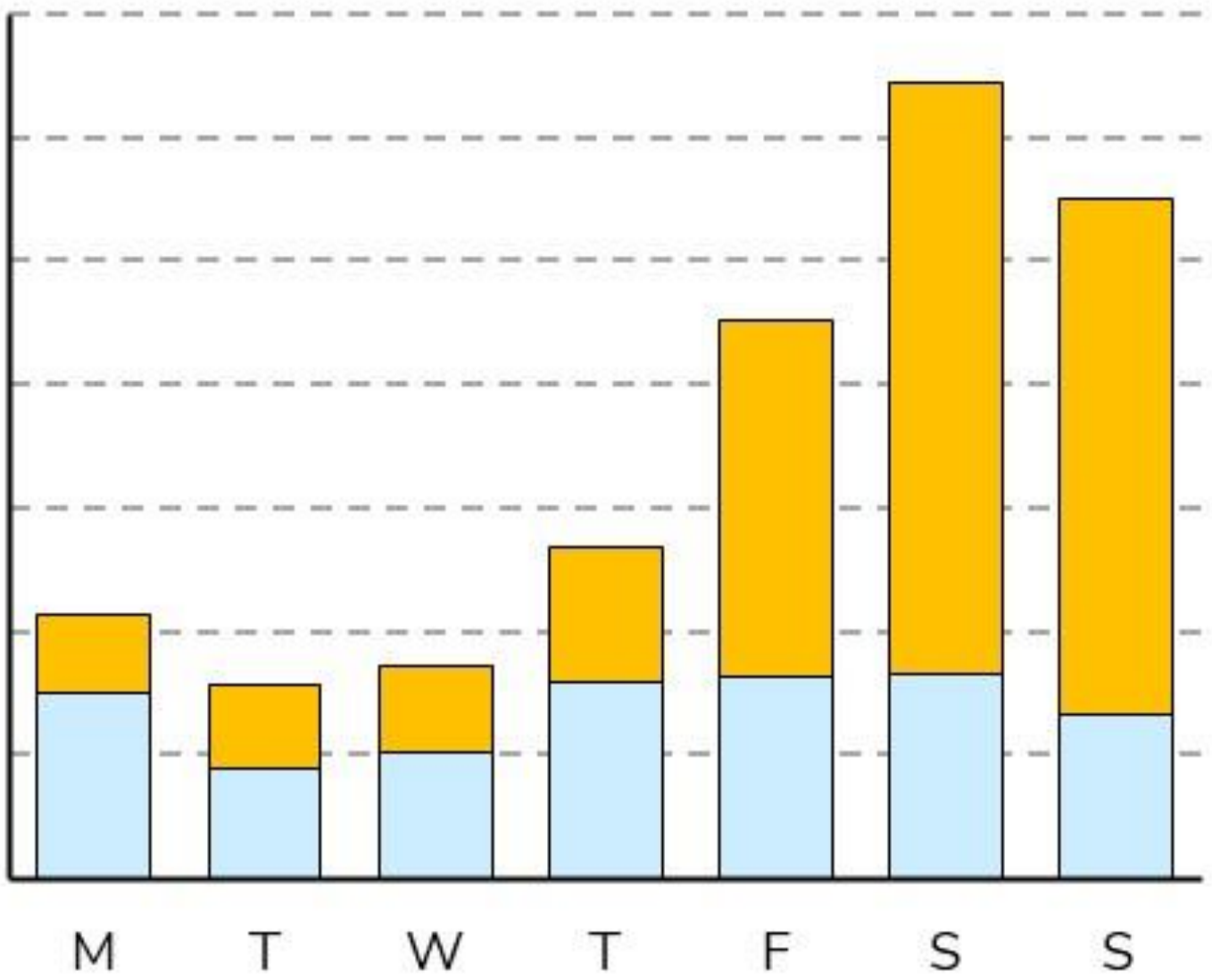
ROUND 3, QUESTION 6



The bar chart gives information on the number of tickets sold in a cinema last week.

Estimate the **percentage** of tickets sold that were for children.

ROUND 3, QUESTION 6



Estimate the **percentage** of tickets sold that were for children.

Children

Adults

End of Round 3

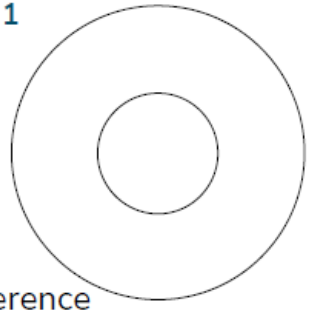
Please finalise your answers, and pass them to your teachers for entry onto the *Google* sheet.

ANSWERS TO ROUND 3

ROUND 3, QUESTION 1

Here are two circles, drawn to scale.

The circumference of the larger circle is 1 metre.



Estimate the circumference of the smaller circle, in cm.

39 to 43 cm

ROUND 3, QUESTION 2

Arrange these calculations in increasing order of value, starting with the smallest.

P 71.3×96.4 Q $1{,}496.85 + 4{,}911.7$

R $4{,}172 \div 0.31$ S $0.215 \times 46{,}122$

On the *Google* sheet, write the four letters in the correct order, without spaces, e.g. PQRS.

QPSR

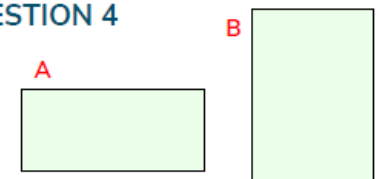
ROUND 3, QUESTION 3

Estimate the length of time, in seconds, for which this picture appears on the screen.

42 seconds

ROUND 3, QUESTION 4

A and B are rectangles.



Estimate the area of A as a fraction of the area of B. The fraction must be in its simplest form.

There are separate spaces on the *Google* sheet for the numerator and denominator of your fraction.

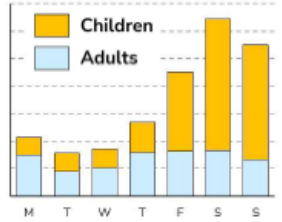
Any fraction between 0.38 and 0.42

ROUND 3, QUESTION 5

Estimate the number represented by the point N on this number line.

7.6 to 7.81

ROUND 3, QUESTION 6



The bar chart gives information on the number of tickets sold in a cinema last week.

Estimate the **percentage** of tickets sold that were for children.

59 to 63%

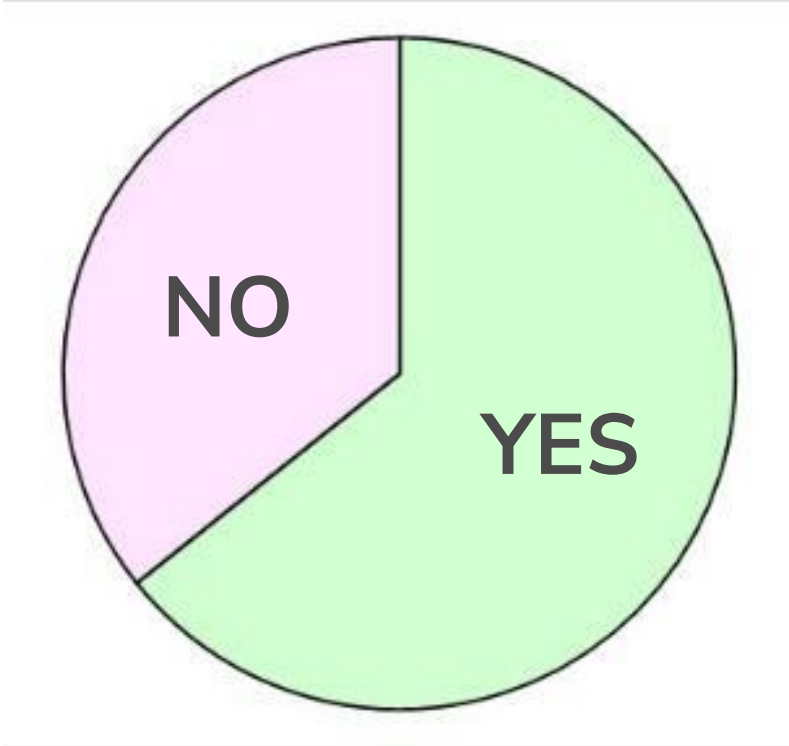
Round 4

General Mathematics Questions

90 seconds for Questions 1 to 5

2 minutes for Question 6

ROUND 4, QUESTION 1



In a survey, 18 people were asked whether they agreed that the school day was too short.

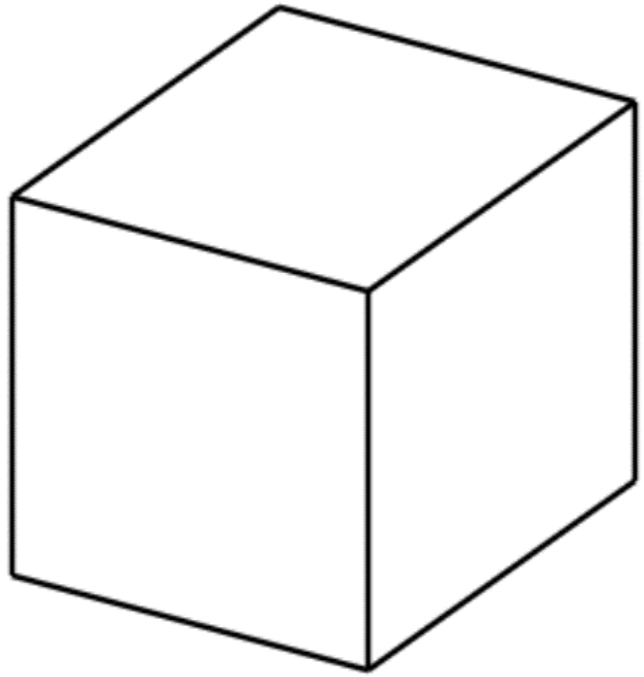
11 people responded ‘YES’ and 7 responded ‘NO’.

A pie chart is to be drawn to show the results of the survey.

What **should** be the angle in the sector marked ‘NO’?

ROUND 4, QUESTION 2

The faces of a cube are painted so that no faces sharing an edge are the same colour.

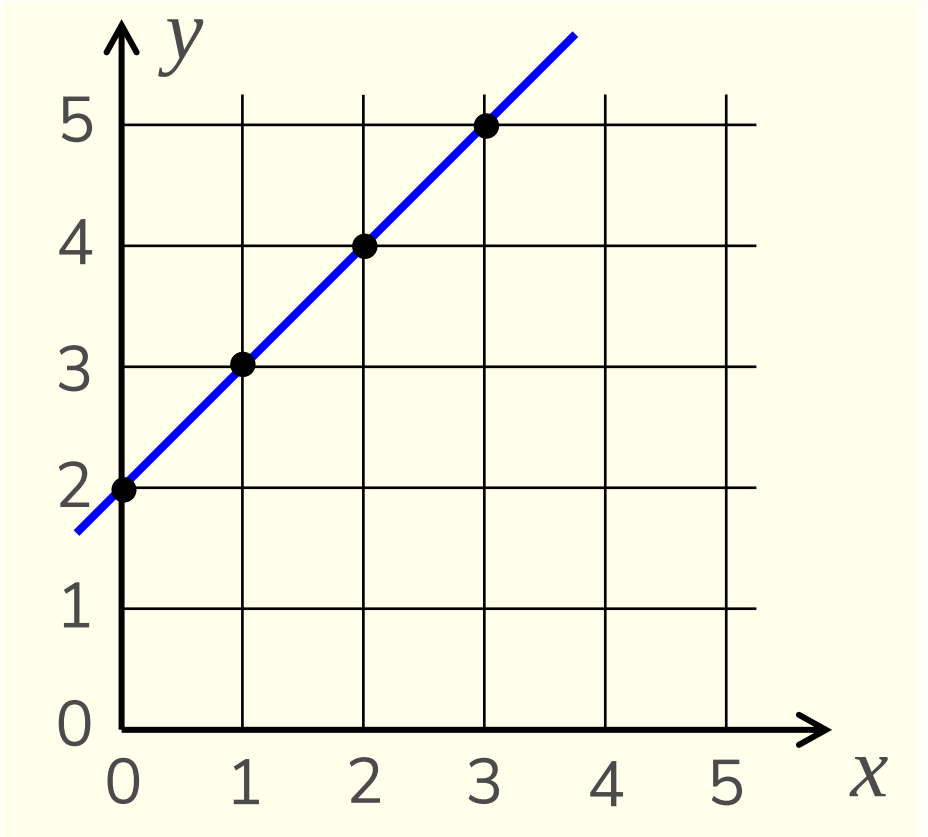


What is the minimum number of different colours needed?

ROUND 4, QUESTION 3

Here is a coordinate grid and part of a straight line, coloured blue.

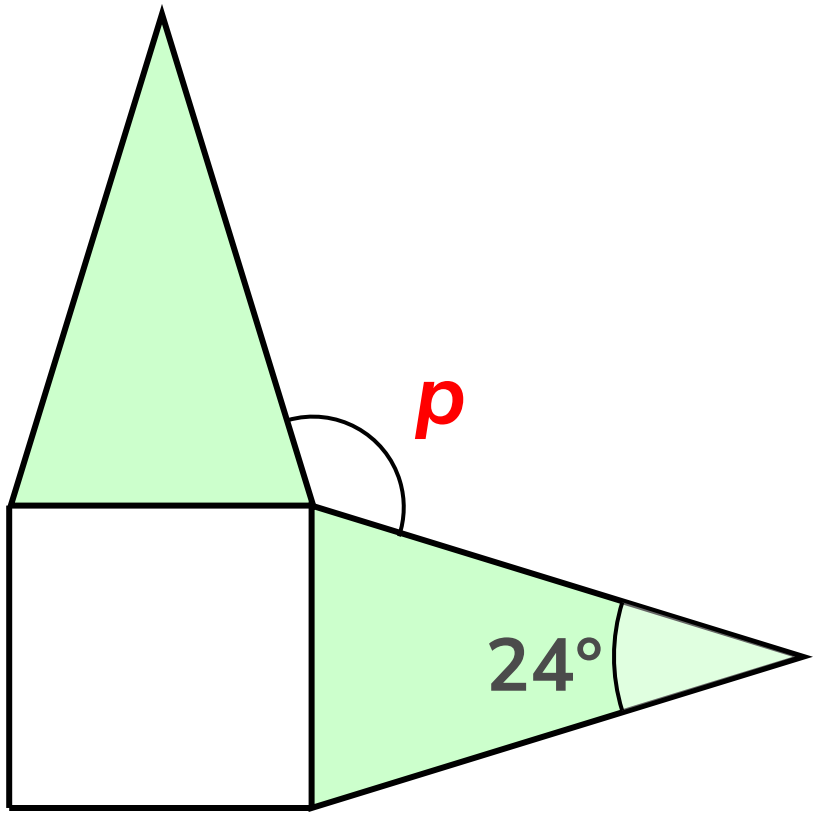
Four points on the line are shown, each with integer coordinates.



Find the coordinates of a point on the blue line, whose x- and y-coordinates are both positive integers with two digits.

On the *Google* sheet there are separate spaces for the x-coordinate and y-coordinate.

ROUND 4, QUESTION 4



The diagram shows a square and two congruent isosceles triangles.

It is **not** drawn to scale.

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

ROUND 4, QUESTION 5

15 can be written as the product of **two different prime numbers** (= 3 × 5).

So can 39 (= 3 × 13).

Find the largest two-digit number that can be written as the product of **two different prime numbers**.

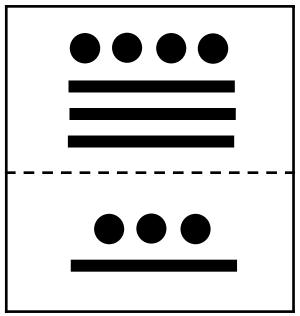
On the *Google* sheet enter the two-digit number only
(not the two primes)

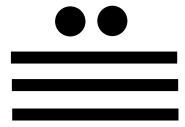
ROUND 4, QUESTION 6

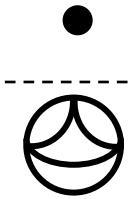
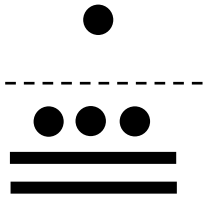
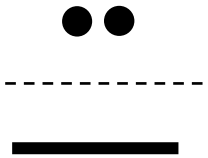
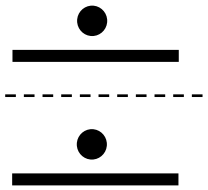
The Mayan civilisation of Central America used their own number system.

The table on the right gives some examples of how they wrote their numbers.

What number does this represent?



0	
1	
4	
5	
6	
10	
17	

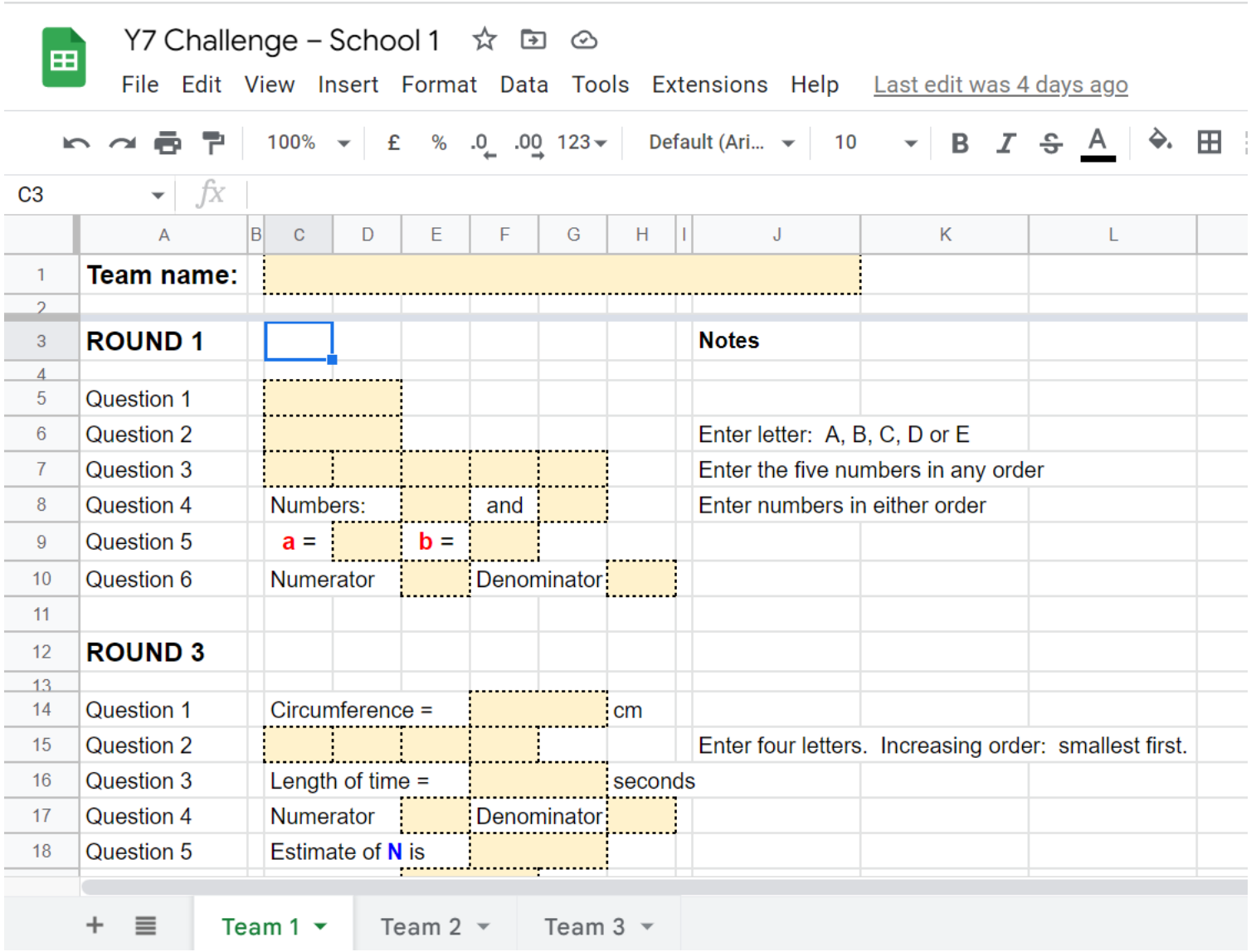
20	
33	
45	
126	

End of Round 4

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

YEAR 7 MATHS CHALLENGE 2023, HEAT 4

Please finalise your *Google* sheet as quickly as possible.



ANSWERS TO ROUND 4

ROUND 4, QUESTION 1

In a survey, 18 people were asked whether they agreed that the school day was too short.

11 people responded 'YES' and 7 responded 'NO'.

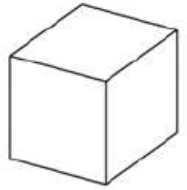
A pie chart is to be drawn to show the results of the survey.

What **should** be the angle in the sector marked 'NO'?

140°

ROUND 4, QUESTION 2

The faces of a cube are painted so that no faces sharing an edge are the same colour.



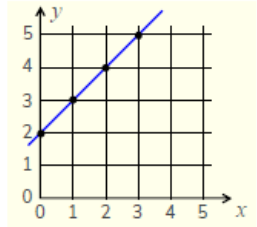
What is the minimum number of different colours needed?

3

ROUND 4, QUESTION 3

Here is a coordinate grid and part of a straight line, coloured blue.

Four points on the line are shown, each with integer coordinates.

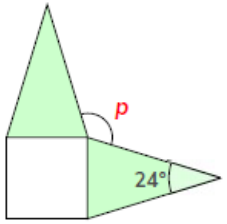


Find the coordinates of a point on the blue line, whose x- and y-coordinates are both positive integers with two digits.

On the *Google* sheet there are separate spaces for the x-coordinate and y-coordinate

e.g. (12, 14)

ROUND 4, QUESTION 4



The diagram shows a square and two congruent isosceles triangles.

It is **not** drawn to scale.

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

114°

ROUND 4, QUESTION 5

15 can be written as the product of **two different prime numbers** (= 3 × 5).

So can 39 (= 3 × 13).

Find the largest two-digit number that can be written as the product of **two different prime numbers**.

On the *Google* sheet enter the two-digit number only (not the two primes)

95

ROUND 4, QUESTION 6

The Mayan civilisation of Central America used their own number system.

The table on the right gives some examples of how they wrote their numbers.

What number does this represent?

0	
1	•
4	••••
5	—
6	•—
10	==
17	•• •••

20	•
33	• •••
45	•• —
126	• •—

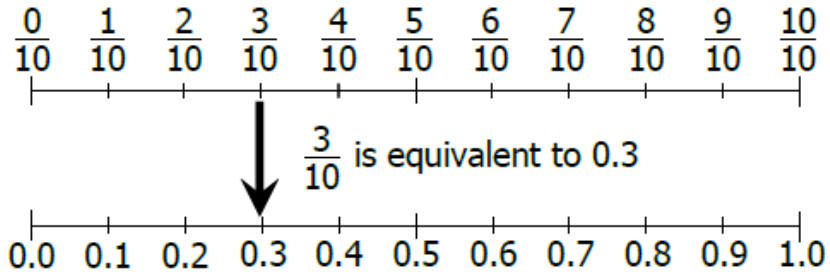
388

YEAR 7 MATHS CHALLENGE 2023, HEAT 4

Results imminent!

Fractions and their equivalent decimals

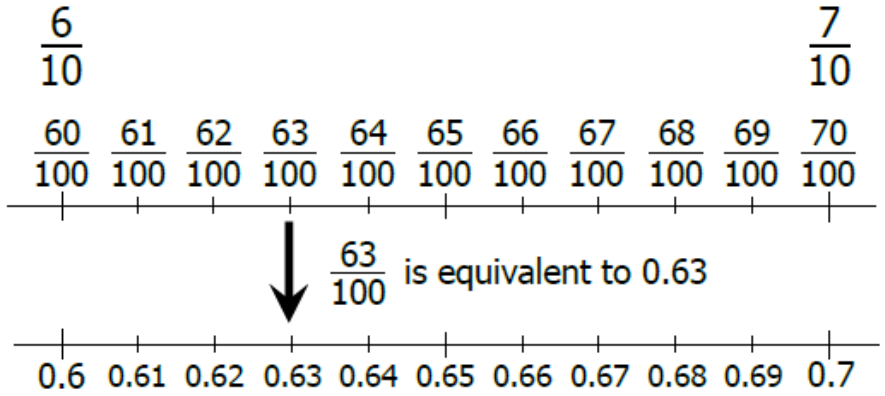
One decimal place



Fractions equivalent to any of these will also have one decimal place, for example:

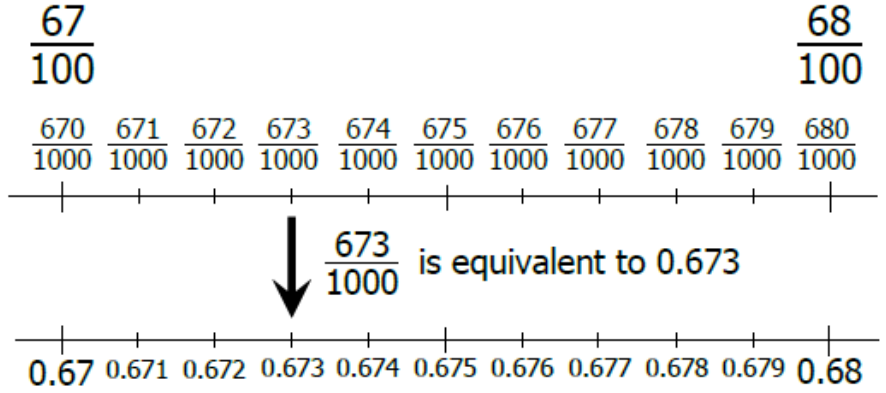
$\frac{1}{2} = \frac{5}{10} = 0.5$ $\frac{18}{30} = \frac{6}{10} = 0.6$ $\frac{28}{35} = \frac{8}{10} = 0.8$

Two decimal places



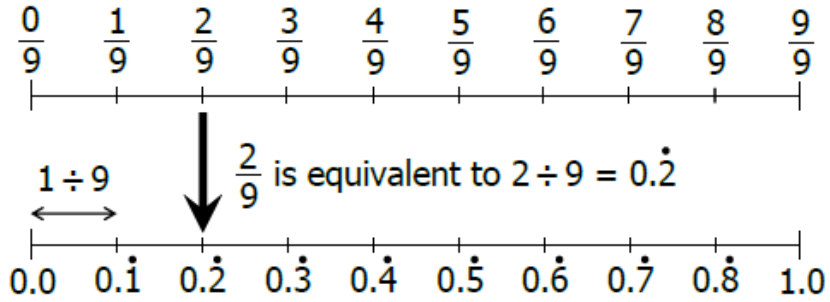
Other examples: $\frac{1}{4} = \frac{25}{100} = 0.25$ $\frac{41}{50} = \frac{82}{100} = 0.82$

Three decimal places



The simplest fraction with 3 d.p. is: $\frac{1}{8} = \frac{125}{1000} = 0.125$

Fractions whose decimals don't terminate



$$9 \overline{)\, 2.^{2}0\ ^{2}0\ ^{2}0\ ^{2}0 \ldots} \quad 0.2\,2\,2\,2\ldots$$

YEAR 7 MATHS CHALLENGE 2023, HEAT 4

Results imminent!

YEAR 7 MATHS CHALLENGE 2023, HEAT 4

Firstly, **well done** to all!

YEAR 7 MATHS CHALLENGE 2023, HEAT 4

Well done to all!

Every team will receive a breakdown of their results by e-mail this evening (or first thing tomorrow morning).

YEAR 7 MATHS CHALLENGE 2023, HEAT 4

Well done to all!

The results are ...

Thank you for taking part.

YEAR 7 MATHEMATICS CHALLENGE

Heat 4, via *Livestorm*

Wednesday 8th March 2023

William Thallon, Secondary Mathematics Adviser

David Cook, Lead Primary Mathematics Adviser

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