YEAR 7 MATHEMATICS CHALLENGE

Heat 1, via *Livestorm*

Wednesday 28th February 2024

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 first 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 Thursday 25th 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. 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 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.

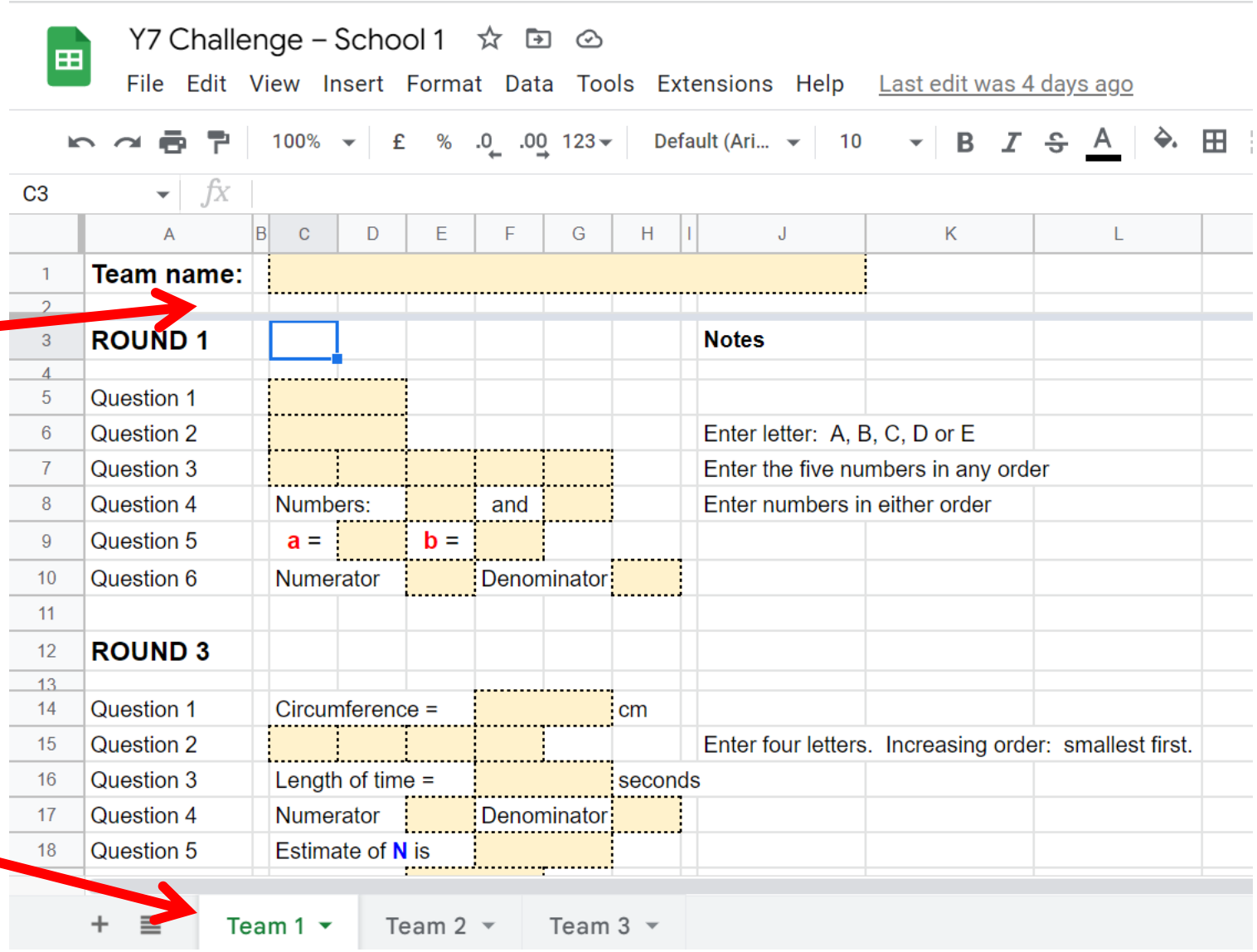
GOOGLE SHEET

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

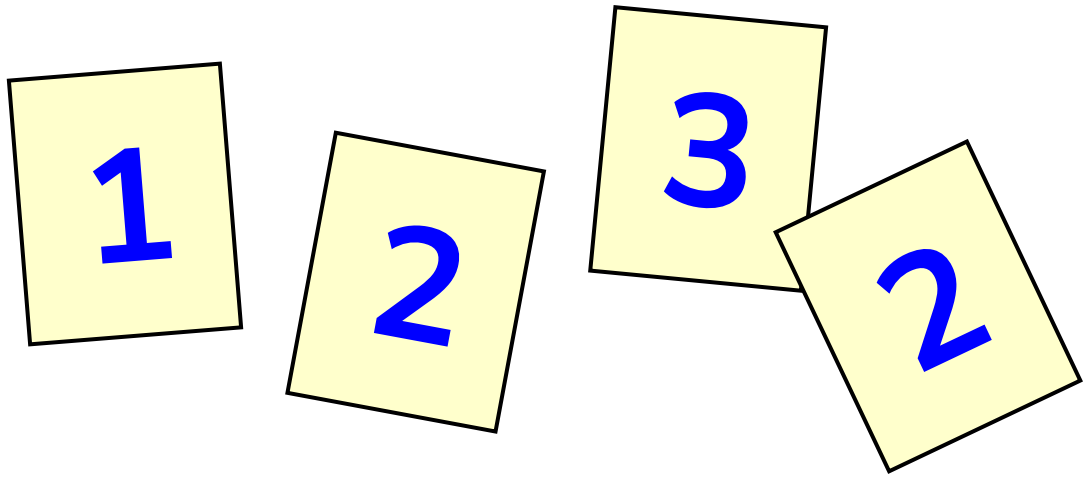
ROUND 1, QUESTION 1

How many prime numbers are there between 30 and 40?

On the *Google* sheet, enter a number between 0 and 9 inclusive.

ROUND 1, QUESTION 2

Here are four number cards.

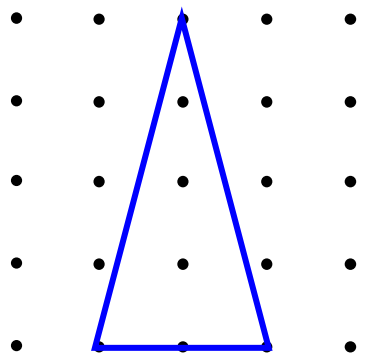


How many **different** 4-digit numbers can be made using these cards?

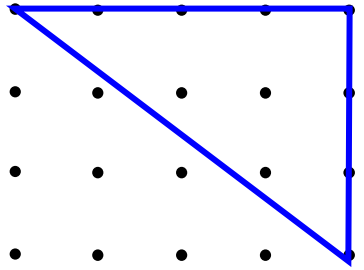
(Each digit must be used exactly once.)

ROUND 1, QUESTION 3

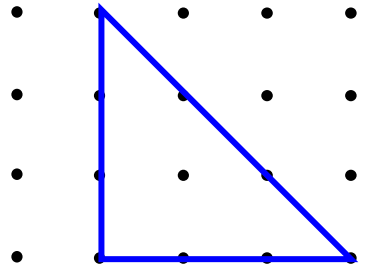
Here are 6 centimetre square dotty grids, with a triangle drawn on each.



A

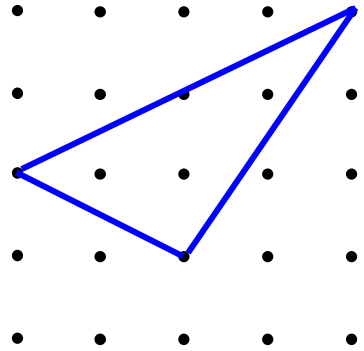


B

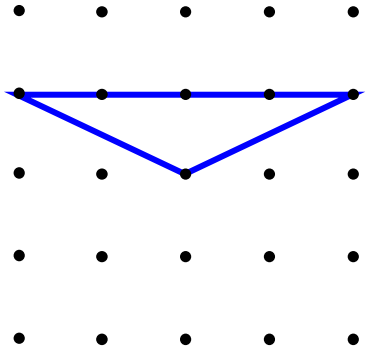


C

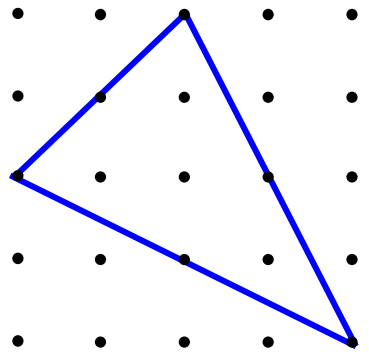
Which of the triangles are isosceles?



D



E



F

On the *Google* sheet, enter the letter of each shape you think is isosceles, one letter in each cell.

ROUND 4, QUESTION 5

What number is missing from these two equivalent fractions?

$$\frac{12}{15} = \frac{\square}{40}$$

ROUND 1, QUESTION 5

Here is the start of a number sequence.

486	**162**								**...**

Each term in the sequence is $\frac{1}{3}$ of the term before it.

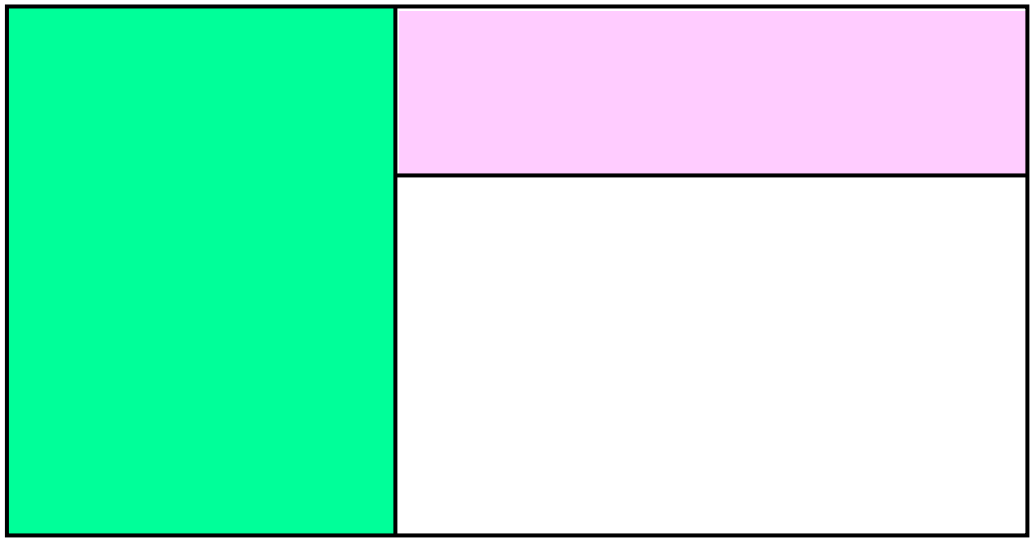
Including the two terms shown, how many terms in the sequence are integers?

(An integer is a whole number.)

ROUND 1, QUESTION 6

$\frac{3}{10}$ of this rectangle is coloured green.

14% of the rectangle is coloured pink.



(not drawn accurately)

In its simplest form, what **fraction** of the rectangle is white?

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

How many prime numbers are there between 30 and 40?

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2

ROUND 1, QUESTION 2

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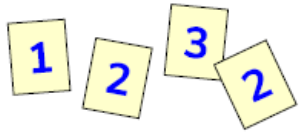


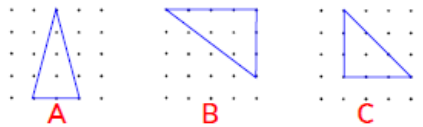
How many **different** 4-digit numbers can be made using these cards?

(Each digit must be used exactly once.)

12

ROUND 1, QUESTION 3

Here are 6 centimetre square dotty grids, with a triangle drawn on each.



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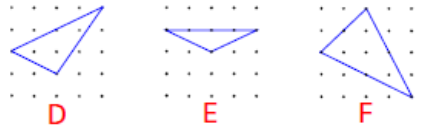

On the *Google* sheet, enter the letter of each shape you think is isosceles, one letter in each cell.

A, C, E, F

ROUND 4, QUESTION 5

What number is missing from these two equivalent fractions?

$$\frac{12}{15} = \frac{\square}{40}$$

32

ROUND 1, QUESTION 5

Here is the start of a number sequence.

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Each term in the sequence is $\frac{1}{3}$ of the term before it.

Including the two terms shown, how many terms in the sequence are integers?

(An integer is a whole number.)

6

ROUND 1, QUESTION 6

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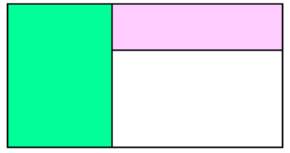


(not drawn accurately)

In its simplest form, what **fraction** of the rectangle is white?

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

$$\frac{14}{25}$$

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

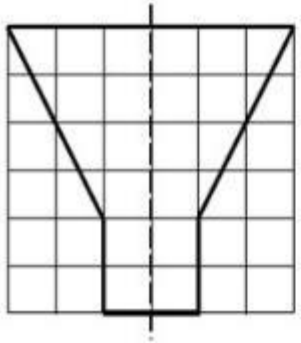
Poster about to be displayed for the first time.

SYMMETRY

Two main types of symmetry

REFLECTION SYMMETRY
ROTATION SYMMETRY

SYMMETRY



This shape has one line of reflection symmetry.

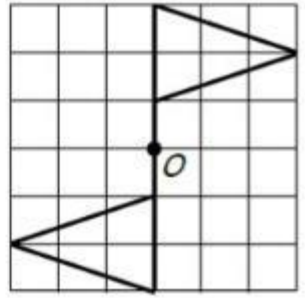
The shape is **invariant** if you reflect it in the broken line.

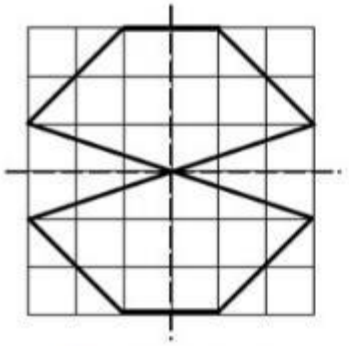
('Invariant' means it doesn't change.)

In this shape, the point *O* is the centre of rotation symmetry.

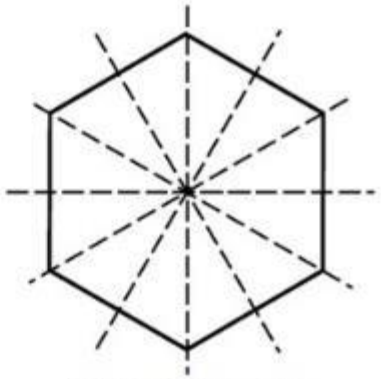
If you rotate the shape about *O* through 180° and 360°, the shape is invariant.

The order of rotation symmetry is 2.

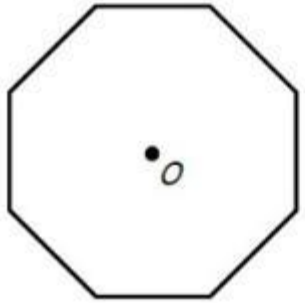




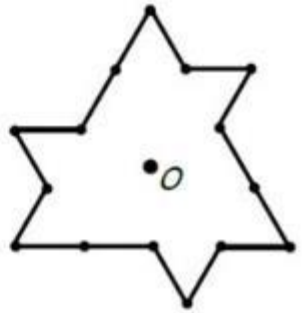
2 lines of symmetry



6 lines of symmetry

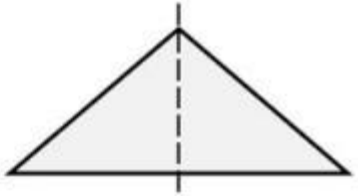


rotation symmetry order 8

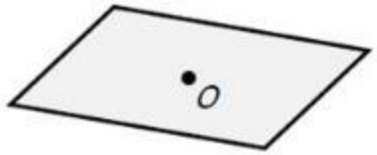


rotation symmetry order 3

SYMMETRY



Isosceles triangle
Reflection symmetry, but no rotation symmetry



Parallelogram
Rotation symmetry, but no reflection symmetry

SYMMETRY

Round 2

Memory Round

ROUND 2

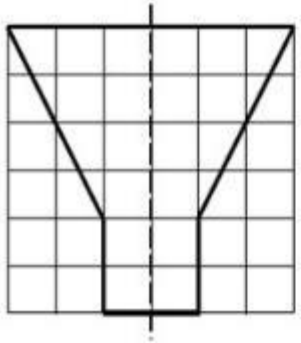
Second viewing of poster coming up!

SYMMETRY

Two main types of symmetry

REFLECTION SYMMETRY
ROTATION SYMMETRY

SYMMETRY



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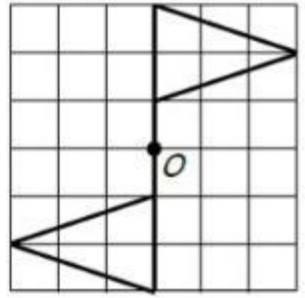
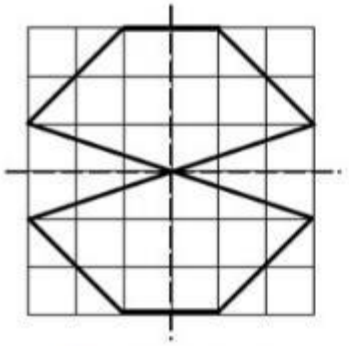
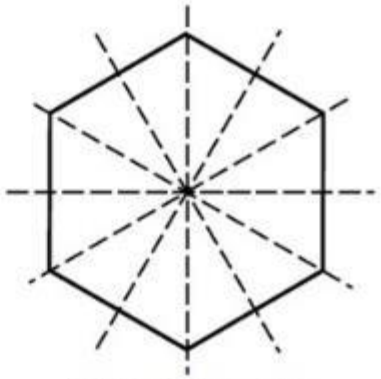




2 lines of symmetry



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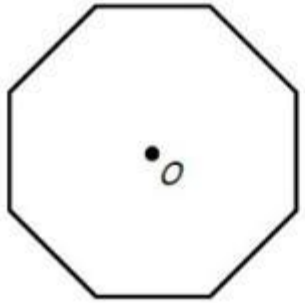

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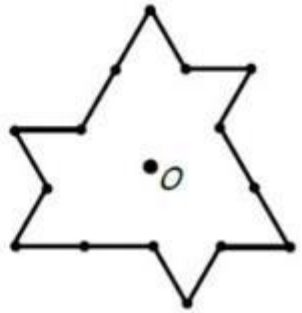
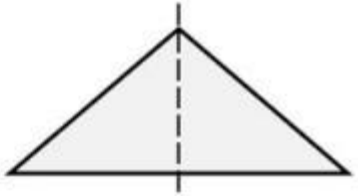
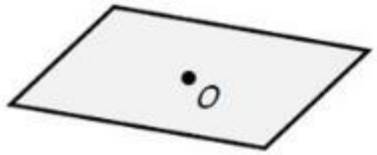


rotation symmetry order 3

SYMMETRY



Isosceles triangle
Reflection symmetry, but no rotation symmetry



Parallelogram
Rotation symmetry, but no reflection symmetry

SYMMETRY

Round 2

Memory Round

ROUND 2

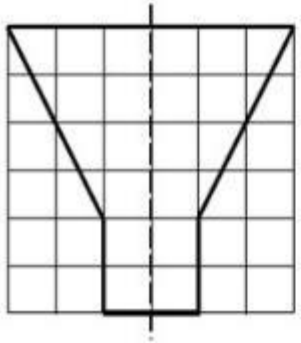
Third viewing of poster coming up!

SYMMETRY

Two main types of symmetry

REFLECTION SYMMETRY
ROTATION SYMMETRY

SYMMETRY



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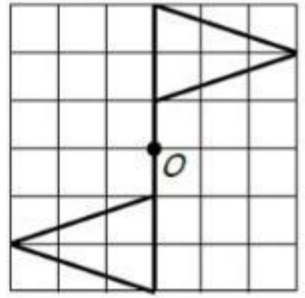
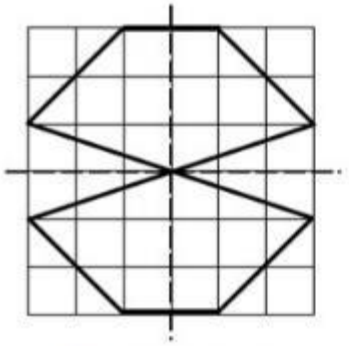
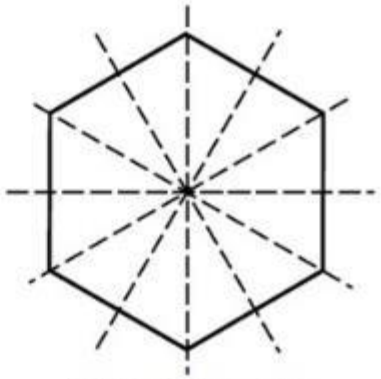




2 lines of symmetry



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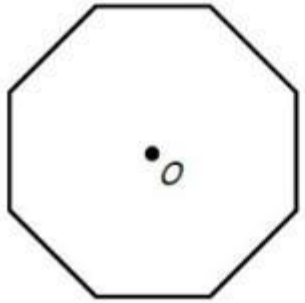
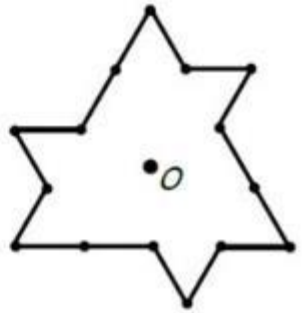
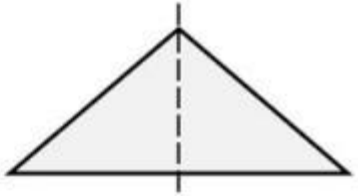


rotation symmetry order 8

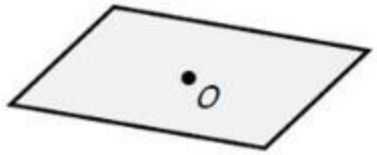


rotation symmetry order 3

SYMMETRY



Isosceles triangle
Reflection symmetry, but no rotation symmetry



Parallelogram
Rotation symmetry, but no reflection symmetry

SYMMETRY

Round 2

Memory Round

ROUND 2

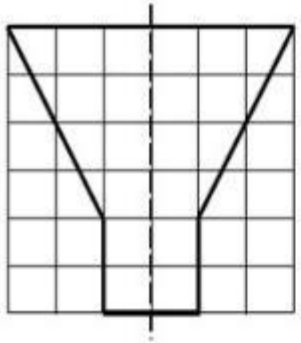
Fourth and final viewing of poster coming up!

SYMMETRY

Two main types of symmetry

REFLECTION SYMMETRY
ROTATION SYMMETRY

SYMMETRY



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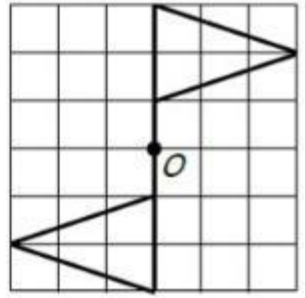
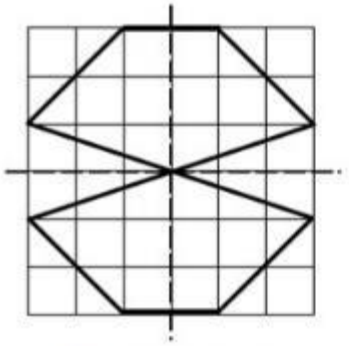
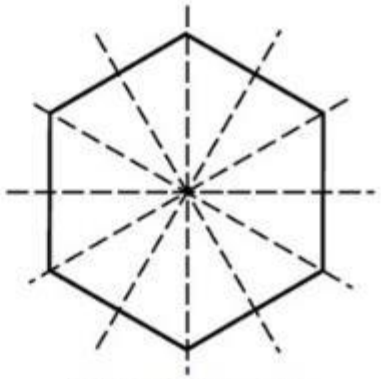
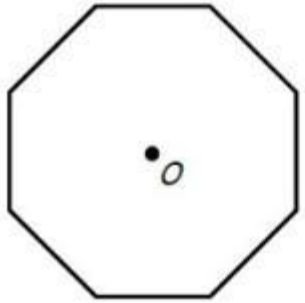




2 lines of symmetry



6 lines of symmetry



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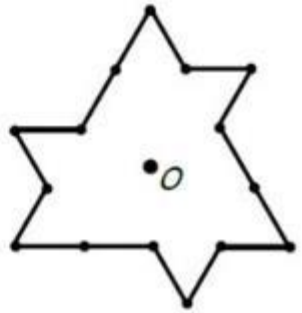

rotation symmetry order 3

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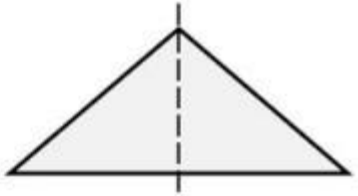
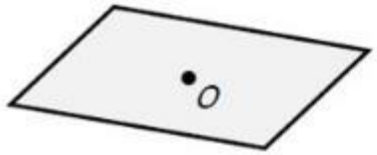


Isosceles triangle
Reflection symmetry, but no rotation symmetry



Parallelogram
Rotation symmetry, but no reflection symmetry

SYMMETRY

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

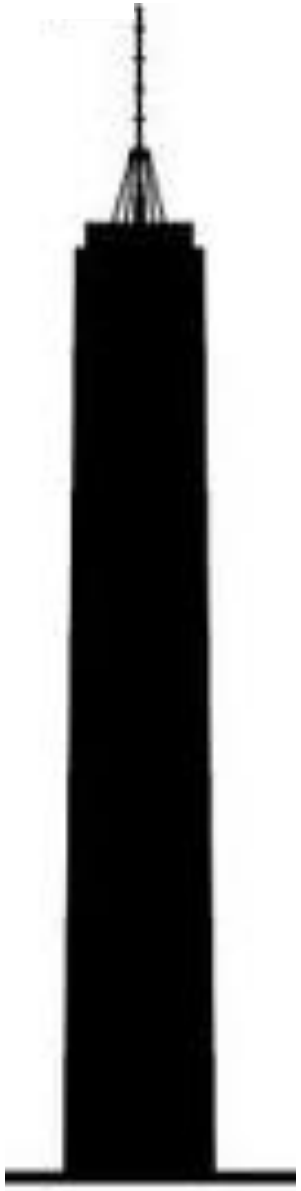
$$\frac{6{,}310 \times 0.77}{39.2}$$

Estimate the answer to this calculation.

ROUND 3, QUESTION 2

The tallest building in North America is 1 World Trade Center, New York City.

It is **541 m** tall.



In the year 200 AD, the tallest building in North America was the Pyramid of the Sun, in Mexico.

Both buildings are shown here to the same scale.

Estimate the height of the Pyramid of the Sun, in metres

ROUND 3, QUESTION 3

On the next slide, there is a piece of text.

Your task will be to estimate the total number of letters in the text.

You will first be given a glimpse for 5 seconds. You will then get 30 seconds to devise a strategy for estimating the answer.

You will then be given 30 seconds, as a team, to estimate the number of **letters** in the text.

(‘Letters’ does not include spaces or punctuation marks.)

My father had a small estate in Nottinghamshire: I was the third of five sons. He sent me to Emanuel College in Cambridge at fourteen years old, where I resided three years, and applied myself close to my studies; but the charge of maintaining me, although I had a very scanty allowance, being too great for a narrow fortune, I was bound apprentice to Mr. James Bates, an eminent surgeon in London, with whom I continued four years. My father now and then sending me small sums of money, I laid them out in learning navigation, and other parts of the mathematics, useful to those who intend to travel, as I always believed it would be, some time or other, my fortune to do. When I left Mr. Bates, I went down to my father: where, by the assistance of him and my uncle John, and some other relations, I got forty pounds, and a promise of thirty pounds a year to maintain me at Leyden: there I studied physic two years and seven months, knowing it would be useful in long voyages.

Soon after my return from Leyden, I was recommended by my good master to be surgeon to the Swallow, Captain Abraham Pannel, commander; with whom I continued three years and a half, making a voyage or two into the Levant, and some other parts. When I came back, I resolved to settle in London; to which my master encouraged me, and by him I was recommended to several patients. I took part of a small house in the Old Quarter; and being advised to alter my condition, I married Mrs. Mary Burton, second daughter to Mr. Edmund Burton, hosier, in Newgate-street, with whom I received four hundred pounds for a portion.

But my good master dying in two years after, and I having few friends, my business began to fail; for my conscience would not suffer me to imitate the bad practice of too many among my brethren. Having therefore consulted with my wife, and some of my acquaintance, I determined to go again to sea. I was surgeon successively in two ships, and made several voyages, for six years, to the East and West Indies, by which I got some addition to my fortune. My hours of leisure I spent in reading the best authors, ancient and modern, being always provided with a good number of books; and when I was ashore, in observing the manners and dispositions of the people, as well as learning their language; wherein I had a great facility, by the strength of my memory.

The last of these voyages not proving very fortunate, I grew weary of the sea, and intended to stay at home with my wife and family. I removed from the Old Quarter to Fetter Lane, and from thence to Wapping, hoping to get business among the sailors; but it would not turn to account. After three years expectation that things would mend, I accepted an advantageous offer from Captain William Prichard, master of the Antelope, who was making a voyage to the South Sea. We set sail from Bristol, and our voyage was at first very prosperous.

Decide on your strategy.

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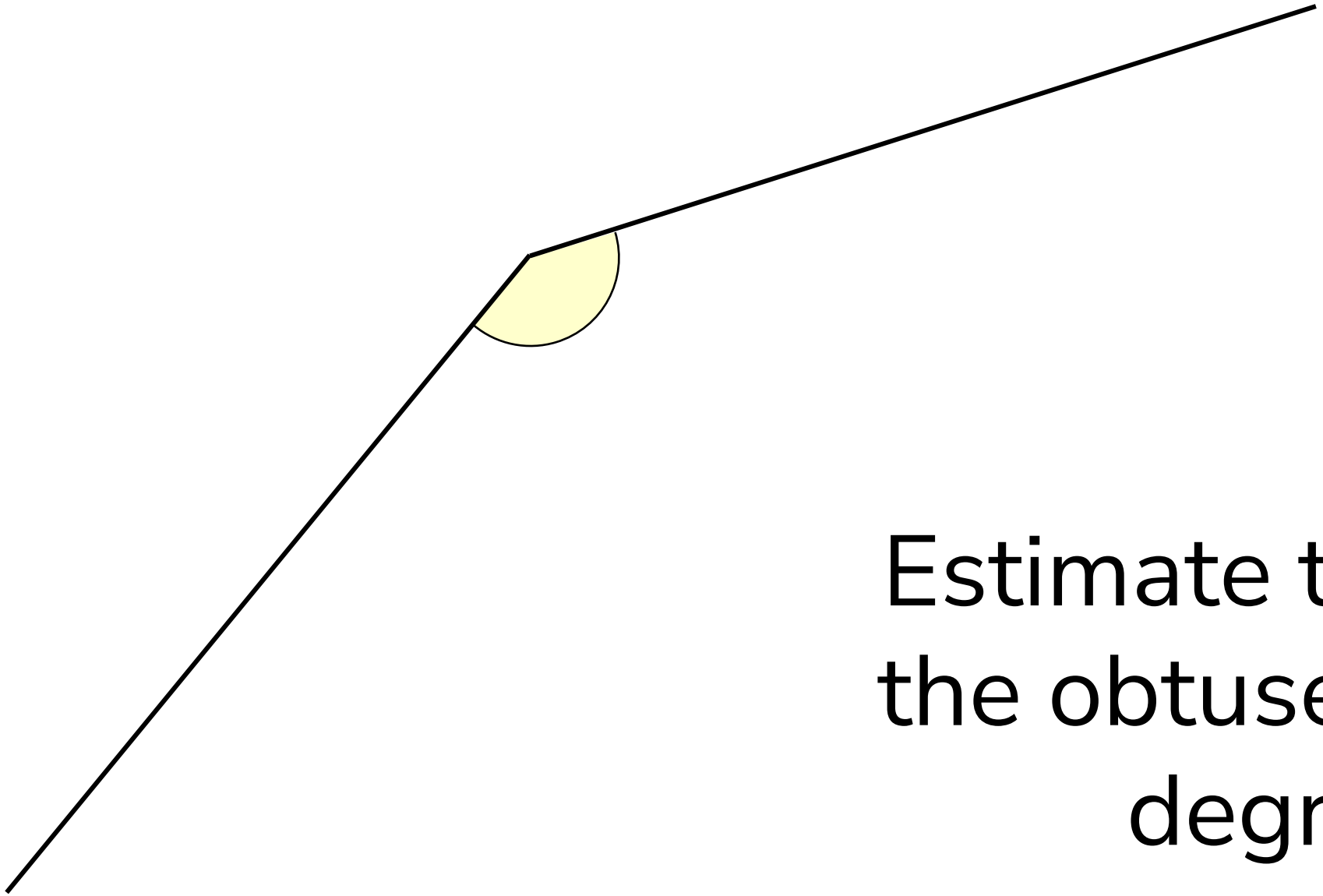
Decide on your estimate.

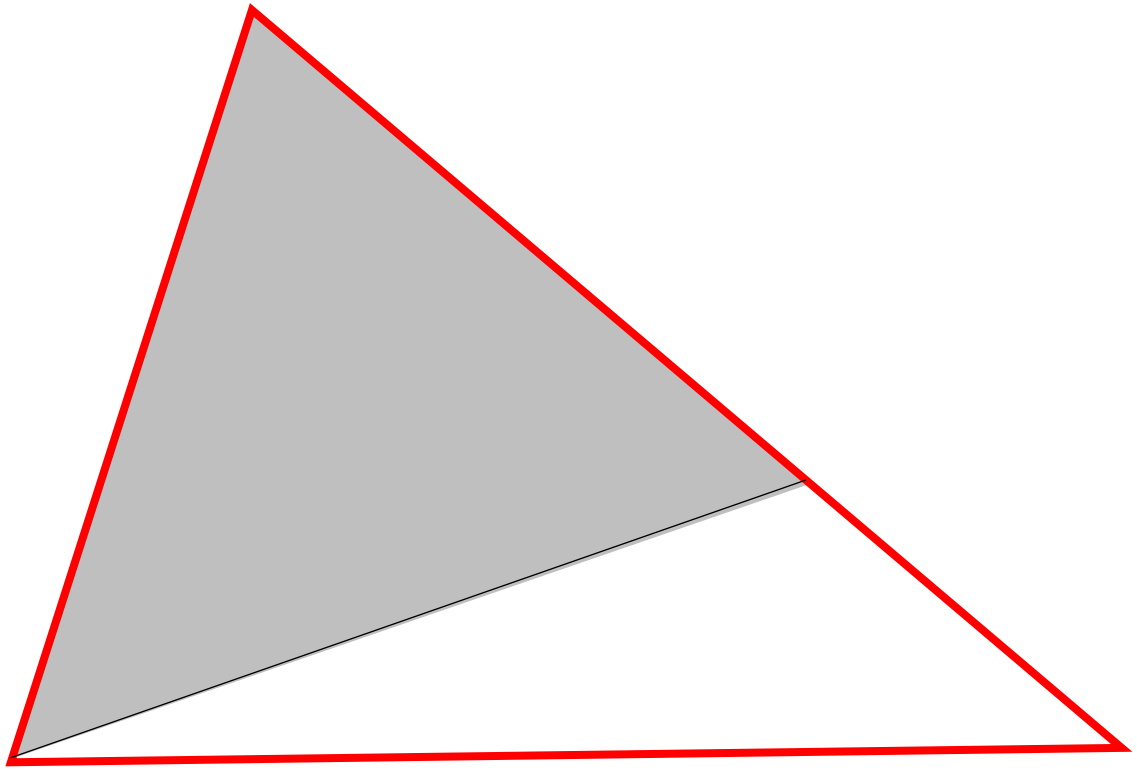
Question 4 coming up …

ROUND 3, QUESTION 4



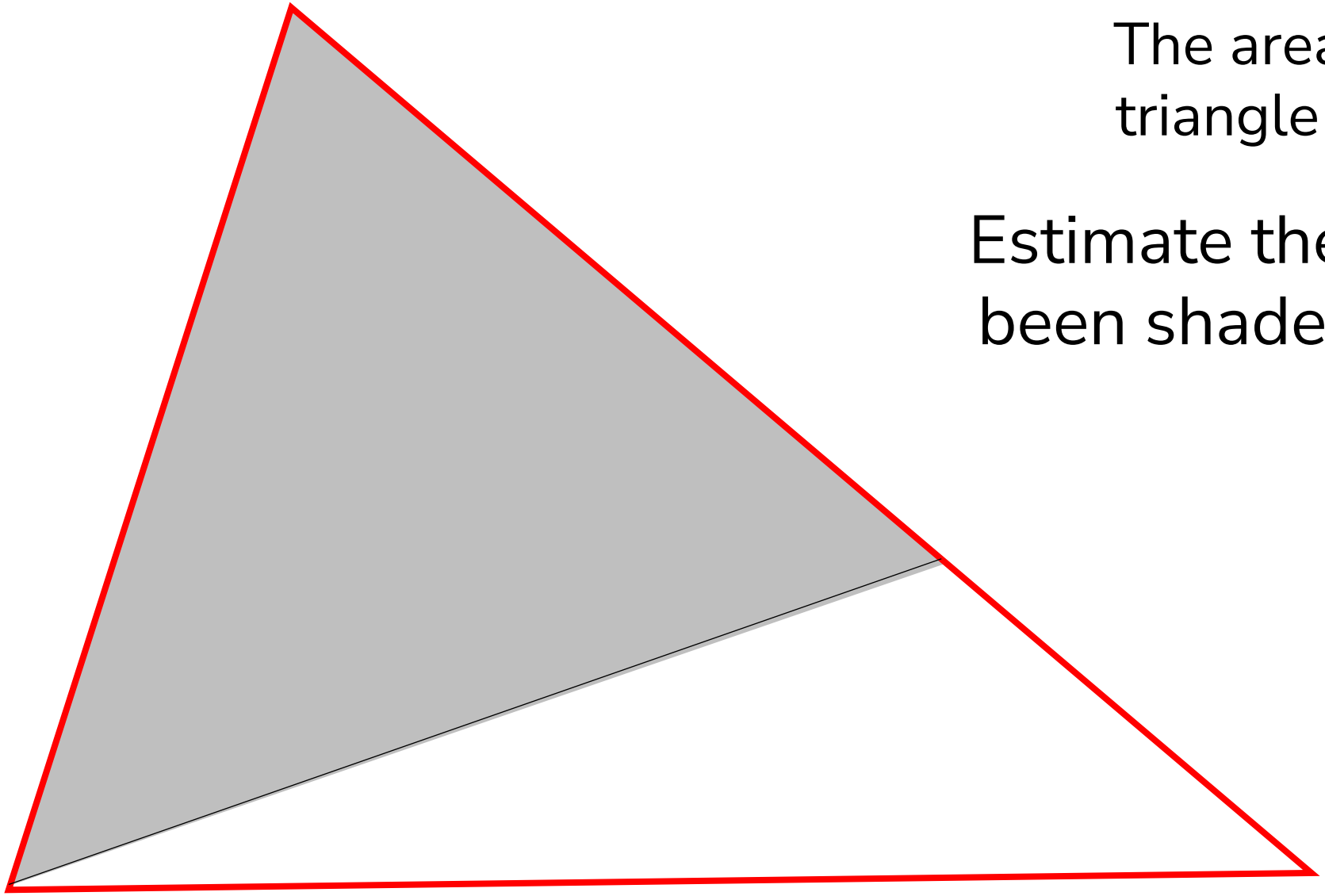
Estimate the size of the obtuse angle, in degrees.

ROUND 3, QUESTION 6



The area of the red triangle is **200 cm²**.

Estimate the area that has been shaded grey, in cm².

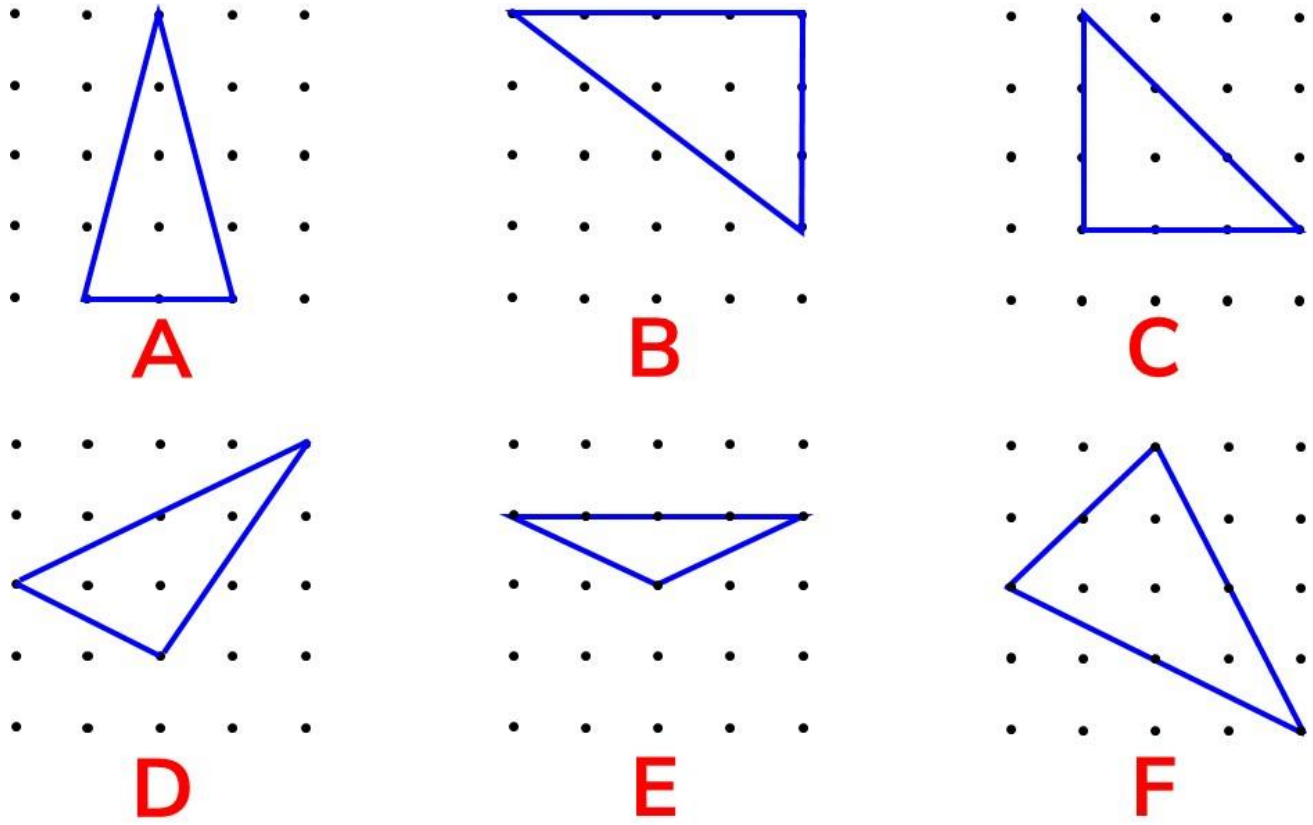


The area of the red triangle is 200 cm²

Estimate the area that has been shaded grey, in cm².

ROUND 3, QUESTION 6

Earlier in the challenge, we showed these diagrams on the screen.



Estimate the number of minutes since they appeared on the screen.

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

$$\frac{6{,}310 \times 0.77}{39.2}$$

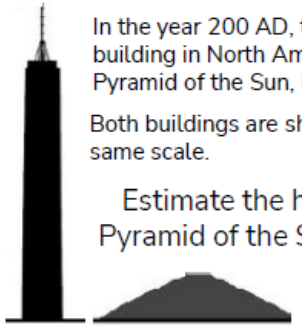
Estimate the answer to this calculation.

115 to 129

ROUND 3, QUESTION 2

The tallest building in North America is 1 World Trade Center, New York City.

It is **541 m** tall.

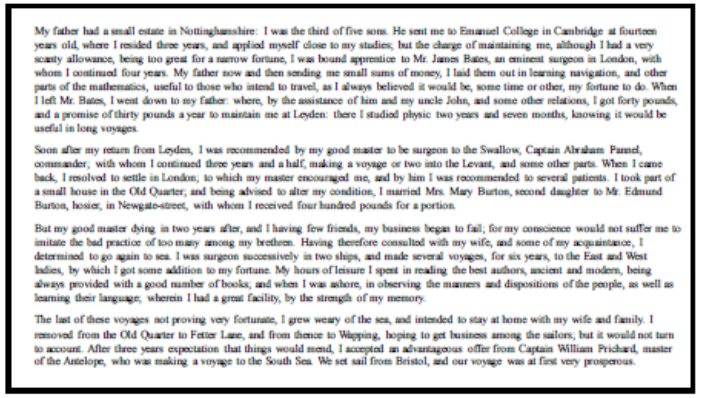


In the year 200 AD, the tallest building in North America was the Pyramid of the Sun, in Mexico.

Both buildings are shown here to the same scale.

Estimate the height of the Pyramid of the Sun, in metres

66 m to 76 m



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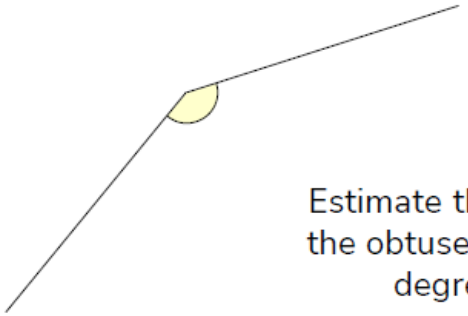
2,100 to 2,400

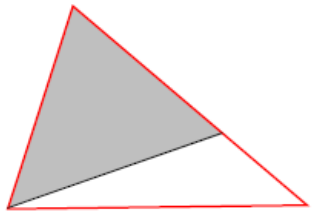
ROUND 3, QUESTION 4



Estimate the size of the obtuse angle, in degrees.

144 to 150°

ROUND 3, QUESTION 6



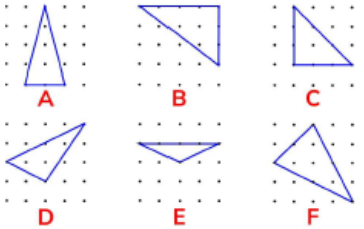
The area of the red triangle is **200 cm²**.

Estimate the area that has been shaded grey, in cm².

120 to 130 cm²

ROUND 3, QUESTION 6

Earlier in the challenge, we showed these diagrams on the screen.



Estimate the number of minutes since they appeared on the screen.

42 to 48 minutes

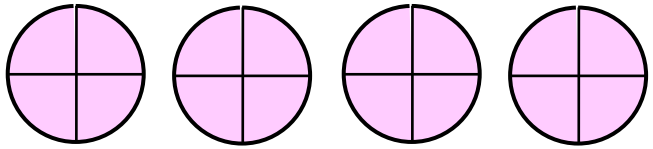
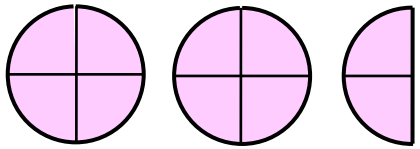
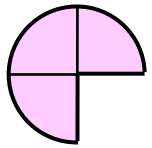
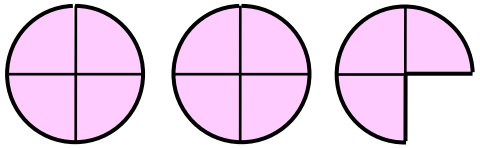
Round 4

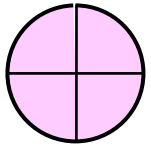
General Mathematics Questions

90 seconds for Questions 1 to 4

2 minutes for Questions 5 and 6

ROUND 4, QUESTION 1

Anna	
Bijal	
Charlie	
Daniel	

 represents 4 sweets

Four people shared a packet of sweets.

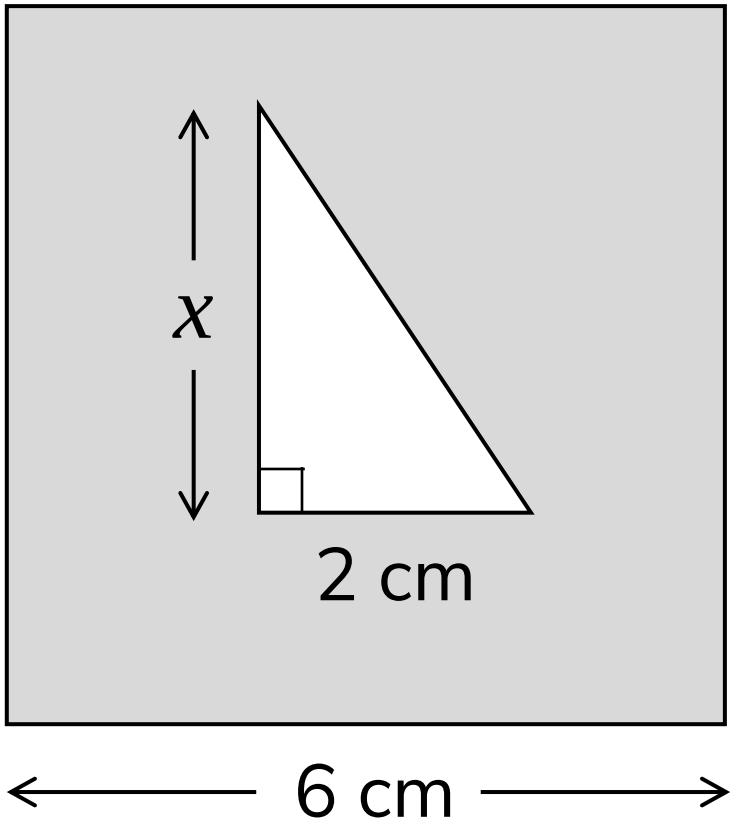
The pictogram shows how many sweets each person ate.

What **percentage** of the sweets were eaten by Anna?

ROUND 4, QUESTION 2

The diagram shows a square with a hole in it. The hole is in the shape of a right-angled triangle. (The diagram is not drawn accurately.)

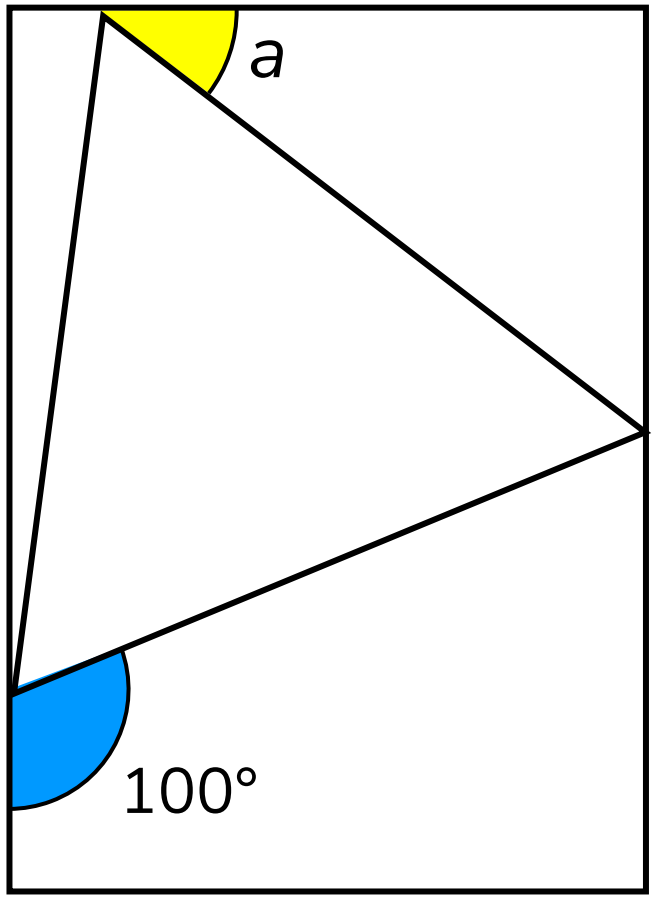
The shaded region has an area of 31 cm².



Work out the height of the triangle (marked x in the diagram)

ROUND 4, QUESTION 3

The diagram shows an **equilateral triangle** inside a **rectangle**. Each vertex of the triangle lies on the perimeter of the rectangle. The diagram is **not** drawn accurately.



The size of the blue angle is 100°.

Work out the size of the yellow angle (labelled ***a***).

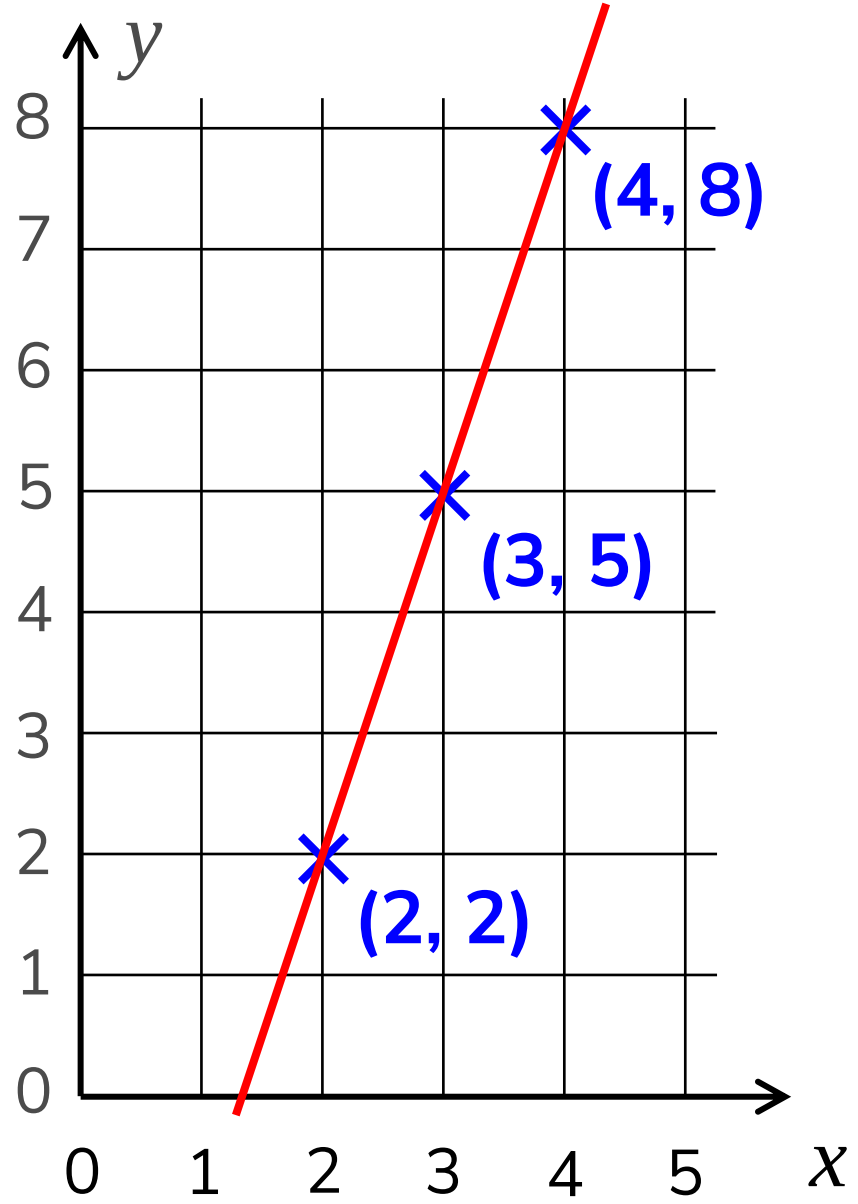
ROUND 4, QUESTION 4

These three points lie in a straight line.

Here are the co-ordinates of two more points that lie further along the same straight line.

(6, □) (△, 50)

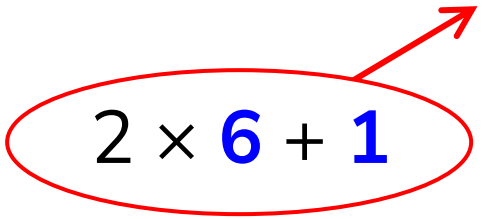
Find the numbers represented by □ and △.



ROUND 4, QUESTION 5

In this number sequence, the next number is obtained by doubling the **ones** digit and adding the **tens** digit:

16 13 7 14 9 18 …



Which **two** numbers, both less than 20, will **never** appear in the sequence?

ROUND 4, QUESTION 6

A, B, C and D are four consecutive numbers, listed in increasing order.

$$A + B + C - D = 28$$

Work out the value of

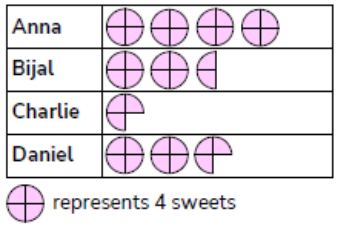
$$A + B + C + D$$

End of Round 4

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

ANSWERS TO ROUND 4

ROUND 4, QUESTION 1



Four people shared a packet of sweets.

The pictogram shows how many sweets each person ate.

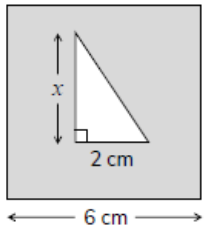
What **percentage** of the sweets were eaten by Anna?

40

ROUND 4, QUESTION 2

The diagram shows a square with a hole in it. The hole is in the shape of a right-angled triangle. (The diagram is not drawn accurately.)

The shaded region has an area of 31 cm².



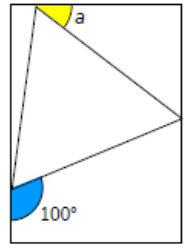
Work out the height of the triangle (marked x in the diagram)

5 cm

ROUND 4, QUESTION 3

The diagram shows an **equilateral triangle** inside a **rectangle**. Each vertex of the triangle lies on the perimeter of the rectangle. The diagram is **not** drawn accurately.

The size of the blue angle is 100°.



Work out the size of the yellow angle (labelled **a**).

50°

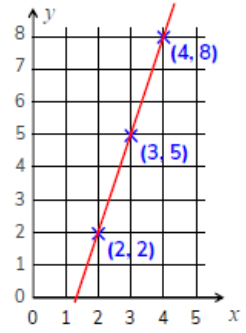
ROUND 4, QUESTION 4

These three points lie in a straight line.

Here are the co-ordinates of two more points that lie further along the same straight line.

(6, □) (△, 50)

Find the numbers represented by □ and △.



□ = 14, △ = 18

ROUND 4, QUESTION 5

In this number sequence, the next number is obtained by doubling the **ones** digit and adding the **tens** digit:

16 13 7 14 9 18 ...

2 × 6 + 1

Which **two** numbers, both less than 20, will **never** appear in the sequence?

(0), 1 and 19

ROUND 4, QUESTION 6

A, B, C and D are four consecutive numbers, listed in increasing order.

$$A + B + C - D = 28$$

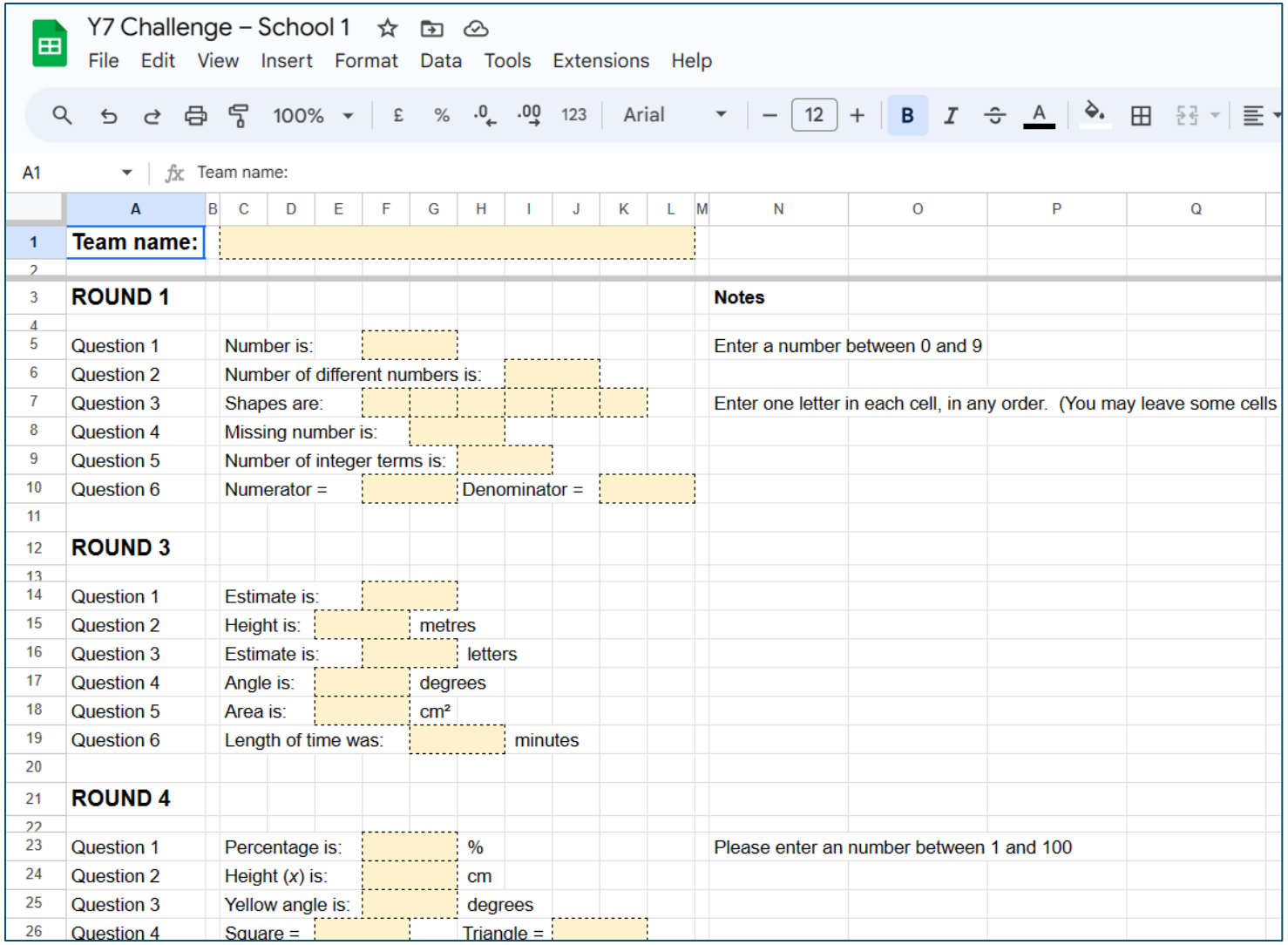
Work out the value of

$$A + B + C + D$$

62

YEAR 7 MATHS CHALLENGE 2024, HEAT 1

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



Y7 Challenge – School 1

File Edit View Insert Format Data Tools Extensions Help

A1 | fx Team name:

	A	C	D	E	F	G	H	I	J	K	L	N	O	P	Q
1	**Team name:**														
3	**ROUND 1**											**Notes**			
5	Question 1	Number is:										Enter a number between 0 and 9			
6	Question 2	Number of different numbers is:													
7	Question 3	Shapes are:										Enter one letter in each cell, in any order. (You may leave some cells			
8	Question 4	Missing number is:													
9	Question 5	Number of integer terms is:													
10	Question 6	Numerator =					Denominator =								
12	**ROUND 3**														
14	Question 1	Estimate is:													
15	Question 2	Height is:				metres									
16	Question 3	Estimate is:				letters									
17	Question 4	Angle is:				degrees									
18	Question 5	Area is:				cm^2									
19	Question 6	Length of time was:				minutes									
21	**ROUND 4**														
23	Question 1	Percentage is:				%						Please enter an number between 1 and 100			
24	Question 2	Height (x) is:				cm									
25	Question 3	Yellow angle is:				degrees									
26	Question 4	Square =					Triangle =								

YEAR 7 MATHS CHALLENGE 2024, HEAT 1

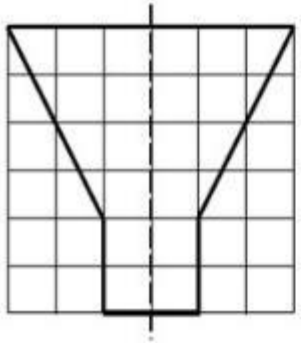
Results imminent!

SYMMETRY

Two main types of symmetry

REFLECTION SYMMETRY
ROTATION SYMMETRY

SYMMETRY



This shape has one line of reflection symmetry.

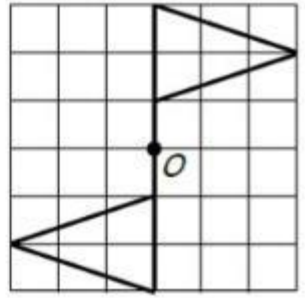
The shape is **invariant** if you reflect it in the broken line.

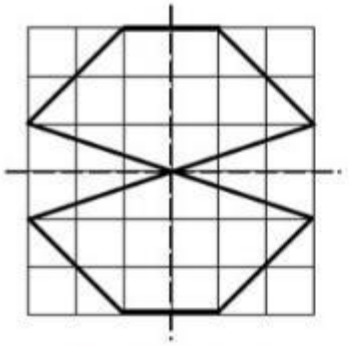
('Invariant' means it doesn't change.)

In this shape, the point *O* is the centre of rotation symmetry.

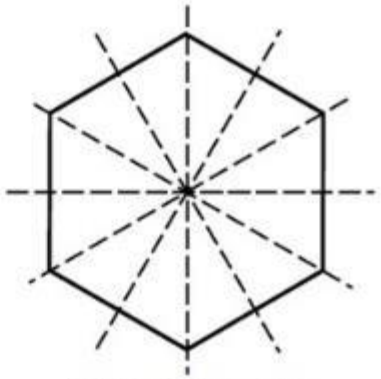
If you rotate the shape about *O* through 180° and 360°, the shape is invariant.

The order of rotation symmetry is 2.

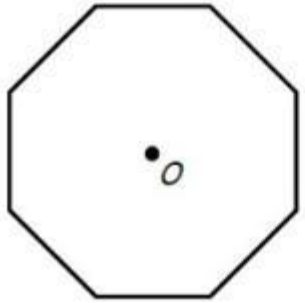




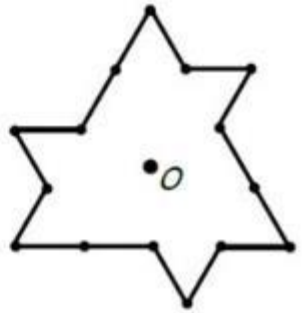
2 lines of symmetry



6 lines of symmetry

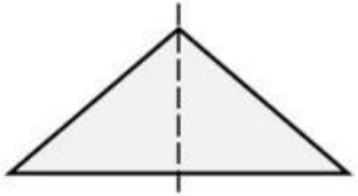


rotation symmetry order 8

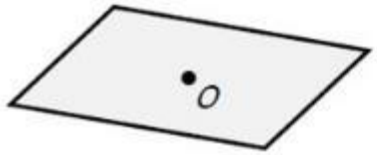


rotation symmetry order 3

SYMMETRY



Isosceles triangle
Reflection symmetry, but no rotation symmetry



Parallelogram
Rotation symmetry, but no reflection symmetry

SYMMETRY

YEAR 7 MATHS CHALLENGE 2024, HEAT 1

Results imminent!

YEAR 7 MATHS CHALLENGE 2024, HEAT 1

Firstly, **well done** to all!

YEAR 7 MATHS CHALLENGE 2024, HEAT 1

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 2024, HEAT 1

Well done to all!

The results are …

Thank you for taking part.

YEAR 7 MATHEMATICS CHALLENGE

Heat 1, via *Livestorm*

Wednesday 28th February 2024

William Thallon, Secondary Mathematics Adviser

David Cook, Lead Primary Mathematics Adviser

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