Year 7 Mathematics Challenge 2021

Final, Wednesday 9th June 2021

via *Livestorm*

William Thallon

Teaching and Learning Adviser (Secondary Maths)

David Cook

Lead Teaching and Learning Adviser (Primary Maths)

@HfLSecMaths

Herts for Learning

A warm welcome to …

Bishops Hatfield
Chauncy A
Chauncy B
Chauncy C
Dame Alice Owen's
Fearnhill School
Goffs Academy A
Goffs Academy B
Hitchin Boys A
Hitchin Boys B
Hockerill
Marlborough A
Marlborough B
Marriotts
Priory
Queens
Richard Hale A
Richard Hale B
Roundwood Park
Townsend A
Townsend B
Watford Boys'
Watford Girls' A
Watford Girls' B

Scores from the heats

Position	Score
1	215
2	206
3	198
4	194
5	190
6	190
7	188
8	188
9	187
10	186
11	181
12	181
13	180
14	178
15	176
16	175
17	174
18	173

Position	Score
19	172
20	171
21	170
22	168
23	166
24	163
25	156
26	155
27	153
28	153
29	152
30	151
31	150
32	147
33	146
34	146
35	146
36	145

Position	Score
37	145
38	144
39	143
40	143
41	143
42	142
43	142
44	136
45	135
46	131
47	130
48	122
49	119
50	115
51	111
52	106
53	97

The Four Rounds

Round 1	General Maths questions
Round 2	Memory Round
Round 3	Estimation and Problem-Solving Round
Round 4	General Maths questions

60 marks for each round.

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!
- Your teacher has been sent a spreadsheet to record your answers. This should be returned by e-mail at the end.

Herts for Learning

Round 1

General Mathematics Questions

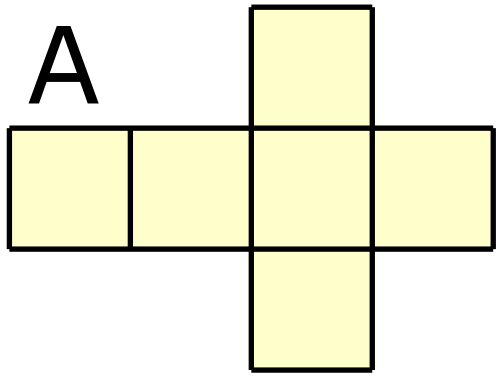
Herts for Learning

Round 1

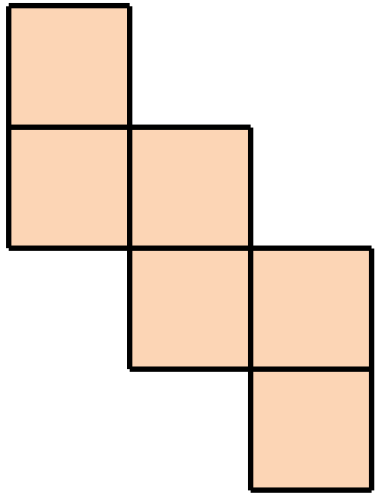
Question 1

Which of these are nets for a cube?

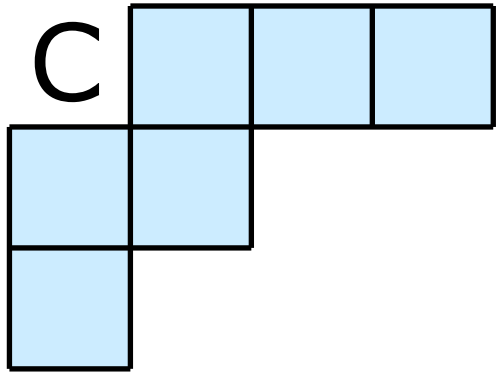
A



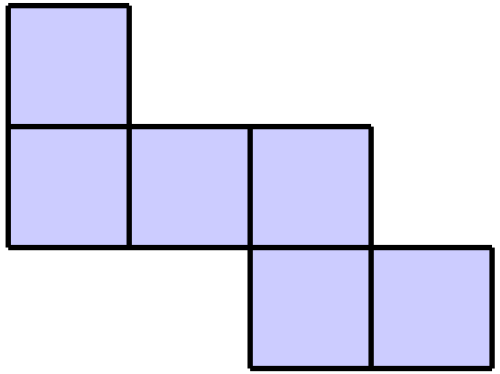
B



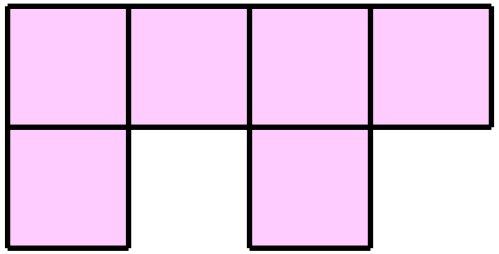
C



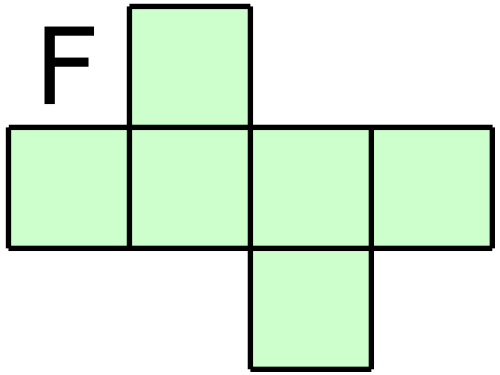
D



E



F



Round 1

Question 2

There are: 12 inches in a foot

3 feet in a yard

1,760 yards in a mile

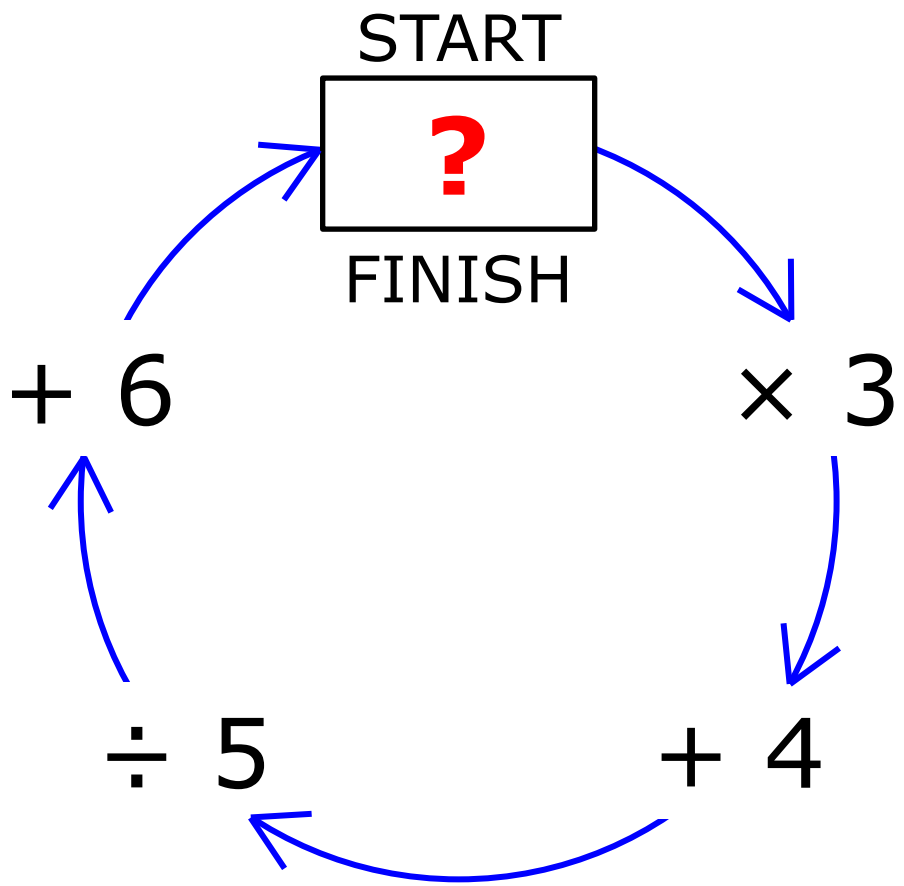
8 furlongs in a mile

How many inches are there in a furlong?

Round 1

Question 3

This circular flow diagram starts and finishes with the same number.



What is the number?

Round 1

Question 4

There are **two** positive integers which:

- are less than 100;
- have exactly six factors;

and

- are multiples of 14.

What are the two numbers?

Round 1

Question 5

I have a number of 1 kg masses, and a different number of 8 kg masses.

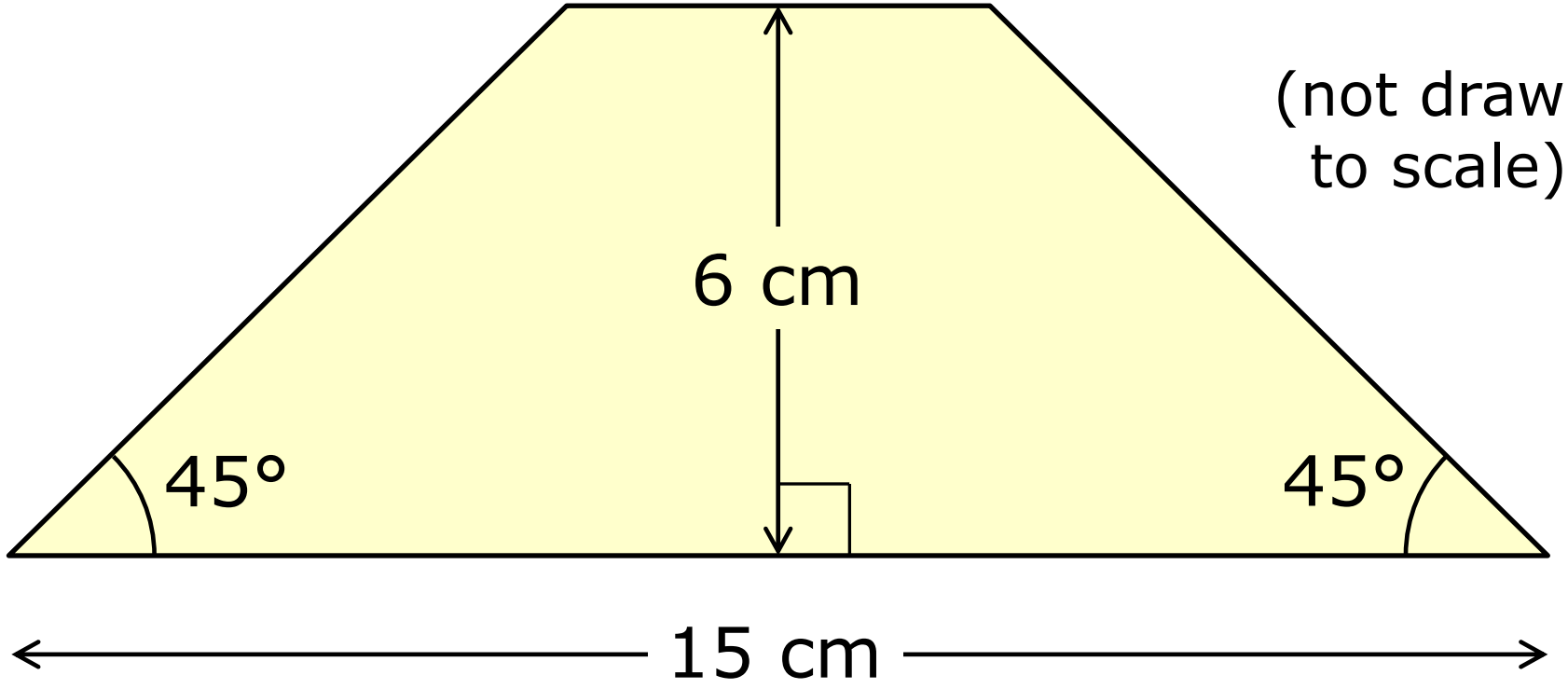
The **mean** mass is 3 kg.

In total, I have **fewer than 10** masses.

How many 1 kg masses and how many 8 kg masses do I have?

Round 1

Question 6



Work out the area of this trapezium, in cm².

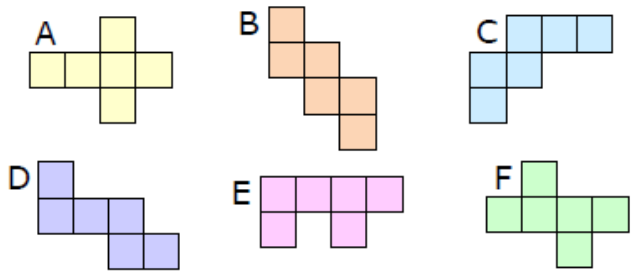
End of Round 1

Round 1

ANSWERS

Round 1 **Question 1**

Which of these are nets for a cube?



A, B, D, F

Round 1 **Question 2**

There are: 12 inches in a foot

3 feet in a yard

1,760 yards in a mile

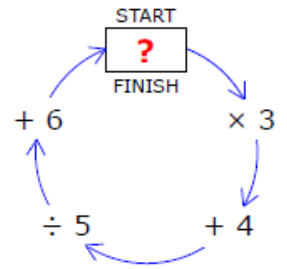
8 furlongs in a mile

How many inches are there in a furlong?

7,920 inches

Round 1 **Question 3**

This circular flow diagram starts and finishes with the same number.



What is the number?

17

Round 1 **Question 4**

There are **two** positive integers which:

- are less than 100;
- have exactly six factors;

and

- are multiples of 14.

What are the two numbers?

28, 98

Round 1 **Question 5**

I have a number of 1 kg masses, and a different number of 8 kg masses.

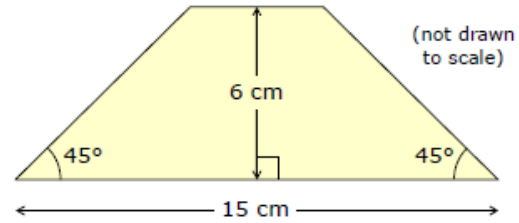
The **mean** mass is 3 kg.

In total, I have **fewer than 10** masses.

How many 1 kg masses and how many 8 kg masses do I have?

5 × 1 kg, 2 × 8 kg

Round 1 **Question 6**



Work out the area of this trapezium, in cm².

54 cm²

Round 2

Memory Round

Herts for Learning

Memory Round: Reminders

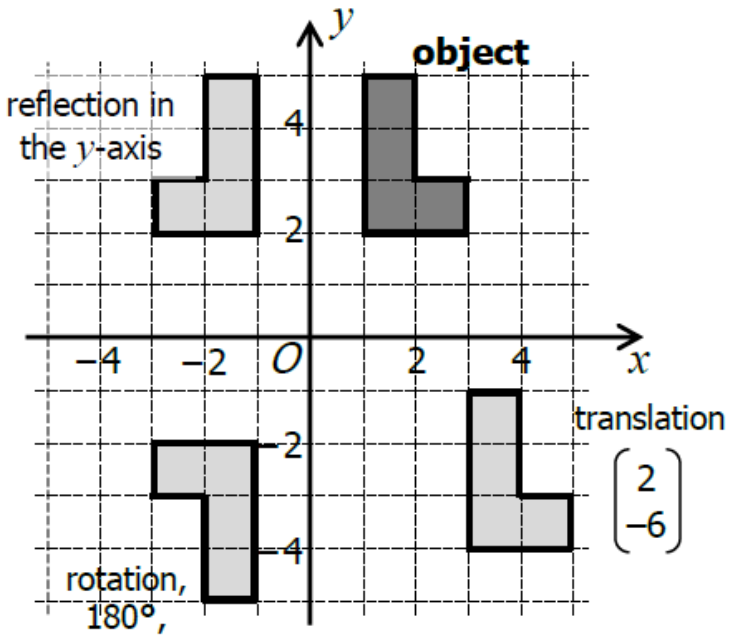
- Words only. No hand-signals!
- (30 seconds to view, 2 minutes to describe) × 4
- Scribes need to be in a different room, so they can’t see the screen.
- Pencils and rubbers only. No rulers or other drawing equipment.
- Poster is in landscape orientation.
- Don’t try to memorise the whole poster in one go.

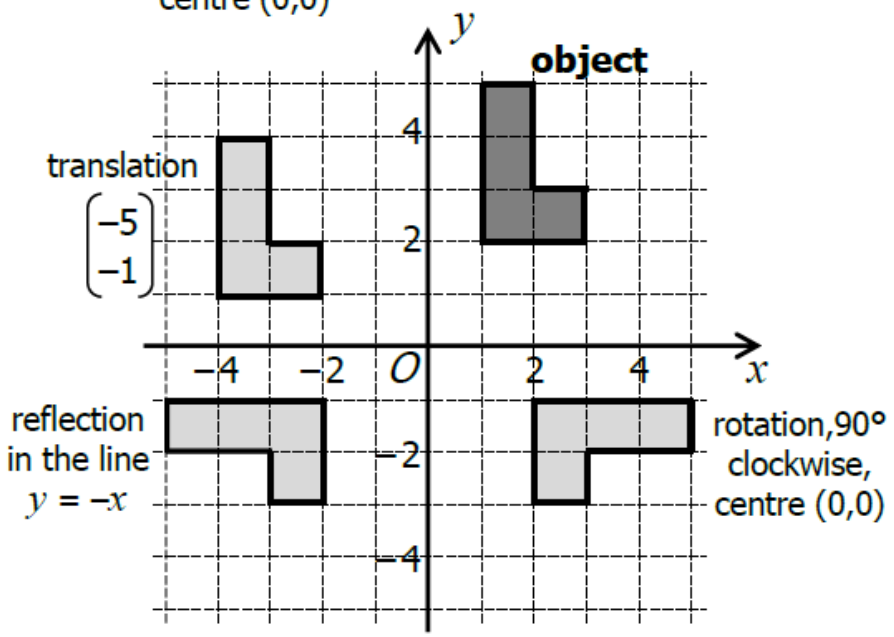
Memory Round

Poster about to be displayed for the first time.

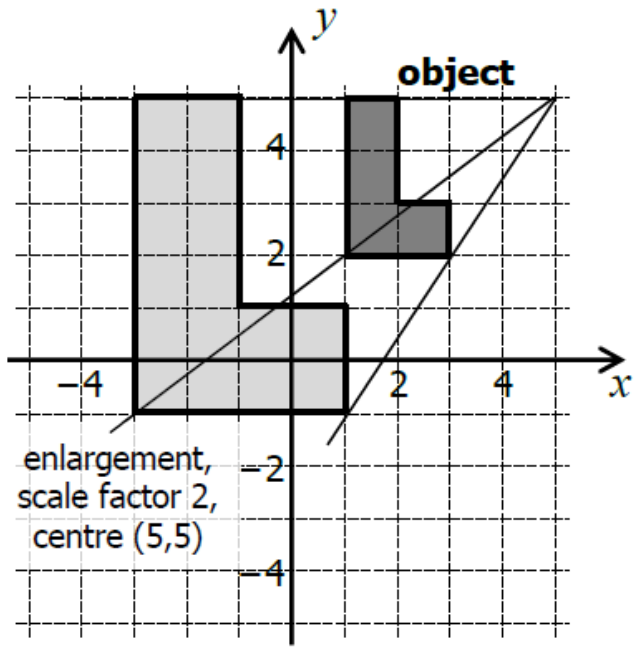
TRANSFORMATIONS

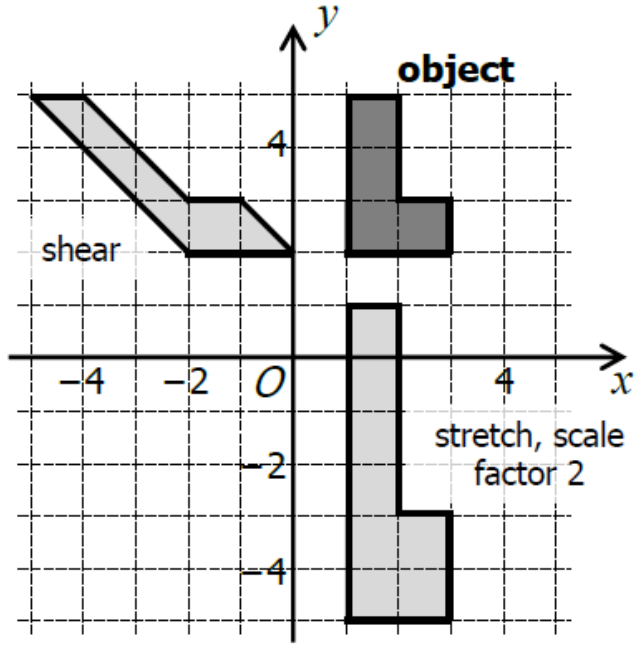
ISOMETRIES





OTHER TYPES





Round 2

Memory Round

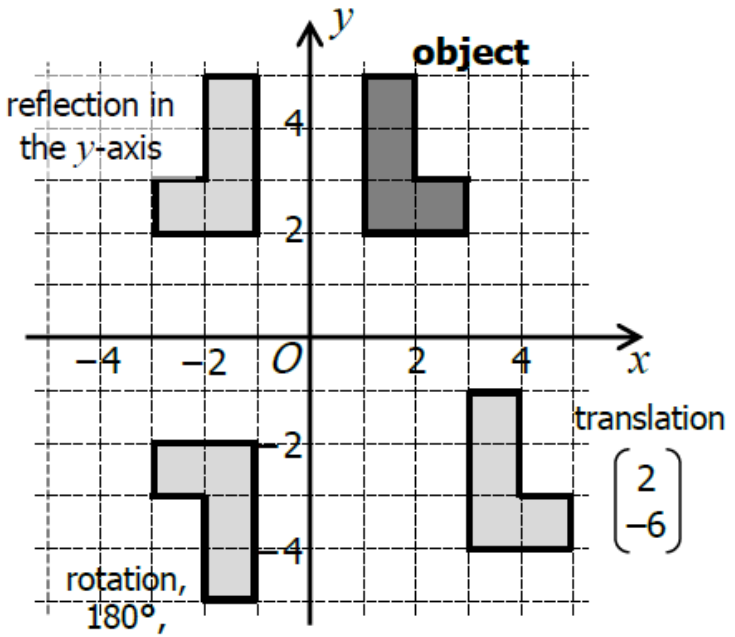
Herts for Learning

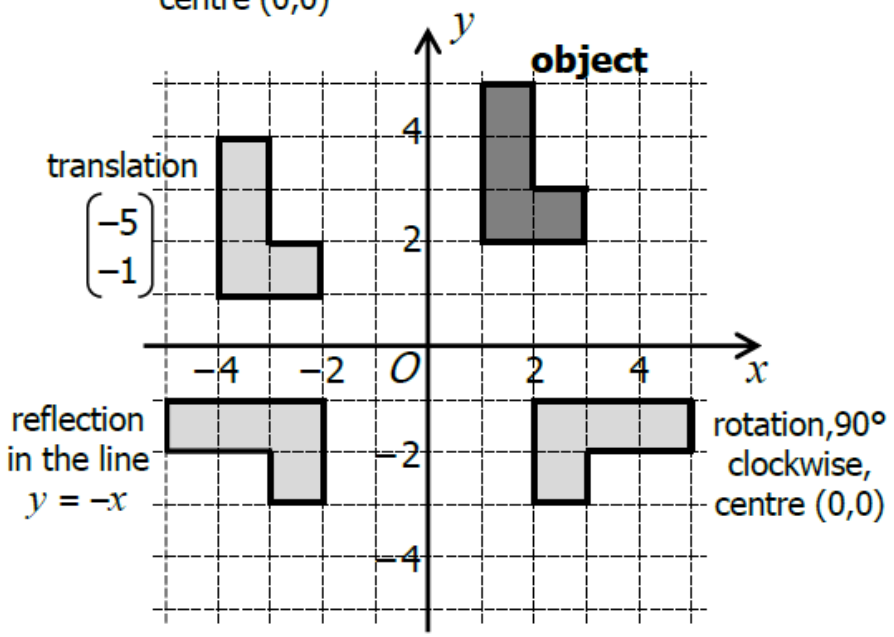
Memory Round

Second viewing of poster coming up!

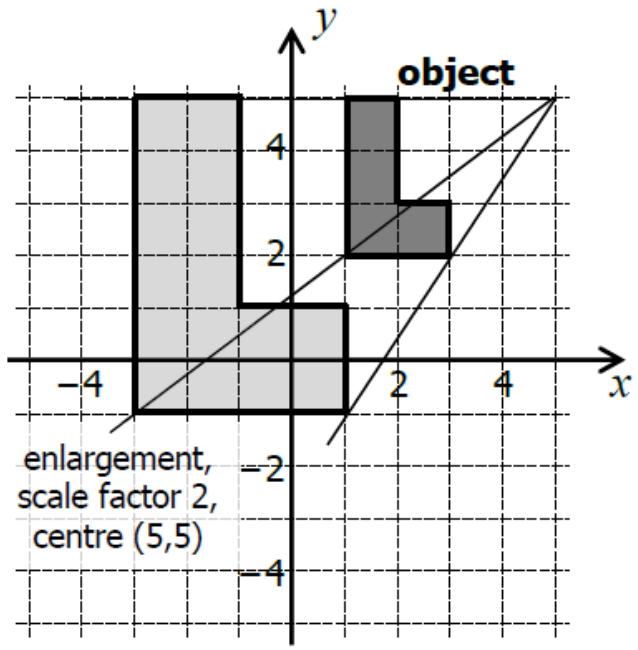
TRANSFORMATIONS

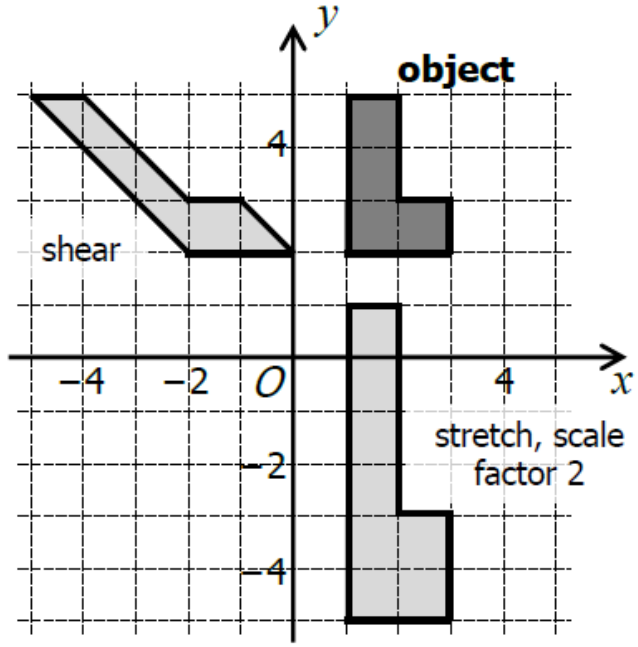
ISOMETRIES





OTHER TYPES





Round 2

Memory Round

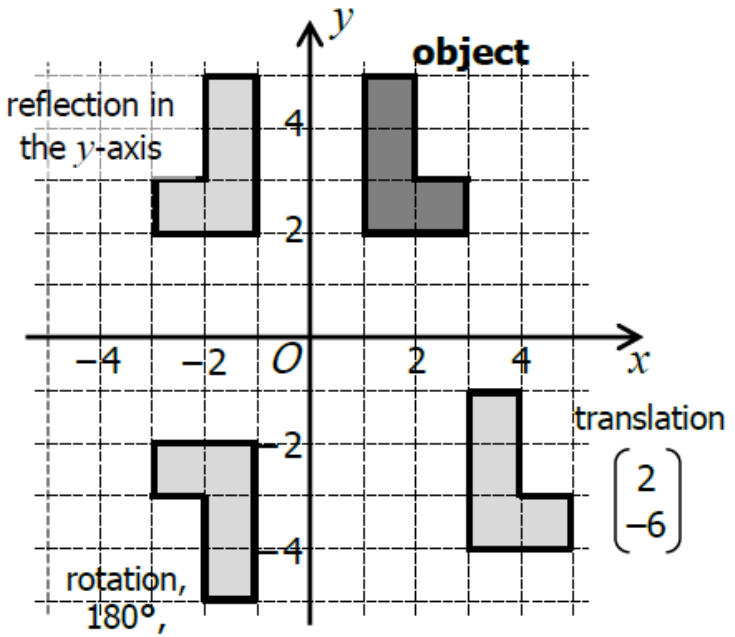
Herts for Learning

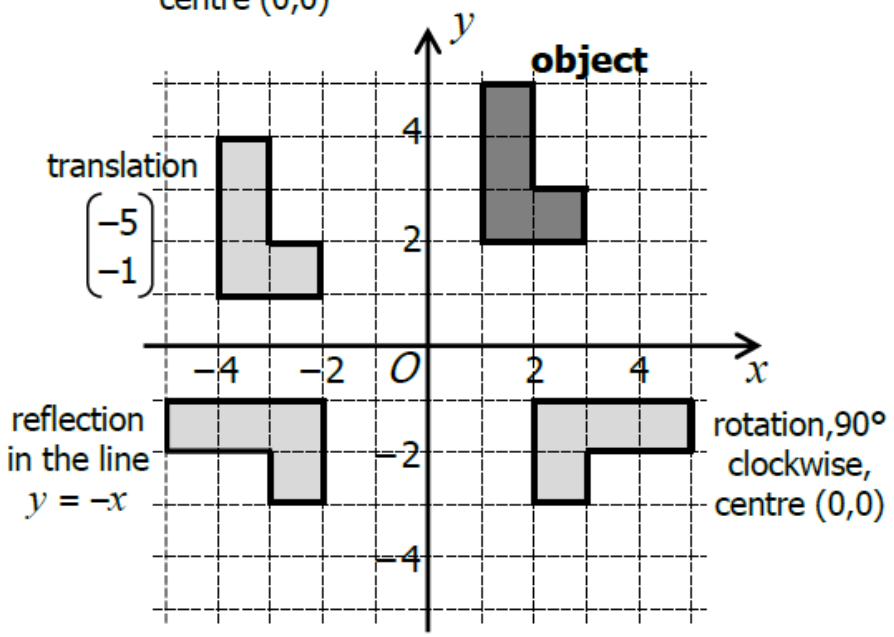
Memory Round

Third viewing of poster coming up!

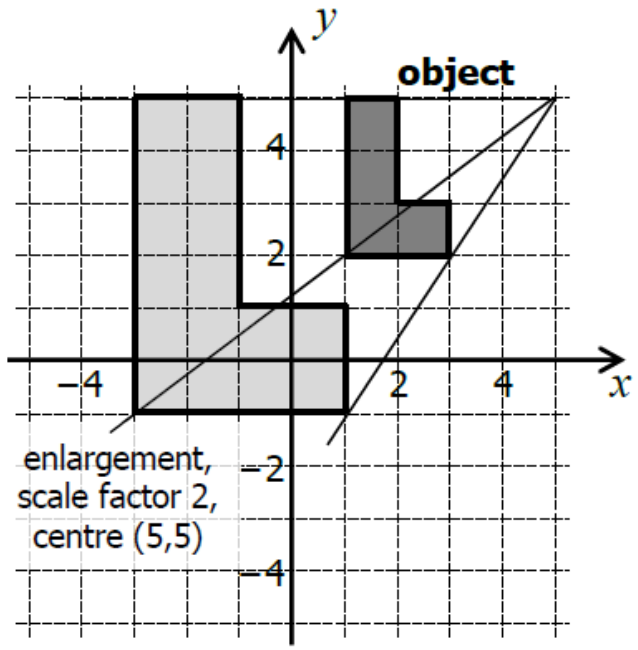
TRANSFORMATIONS

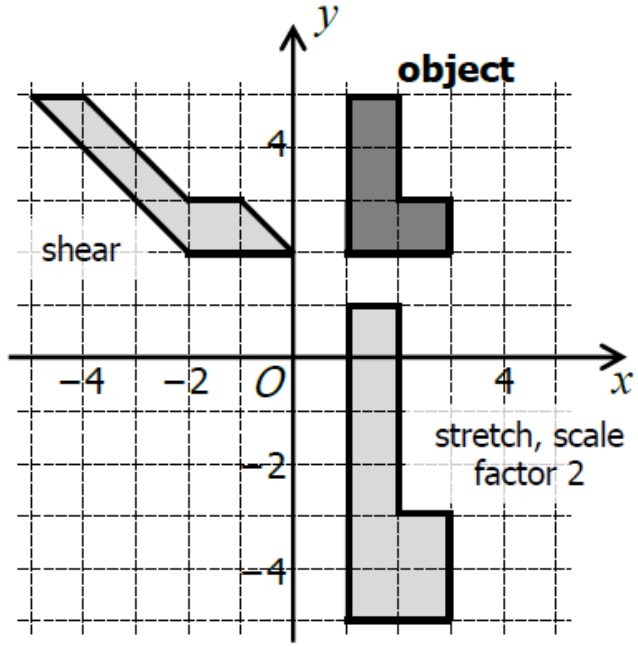
ISOMETRIES





OTHER TYPES





Round 2

Memory Round

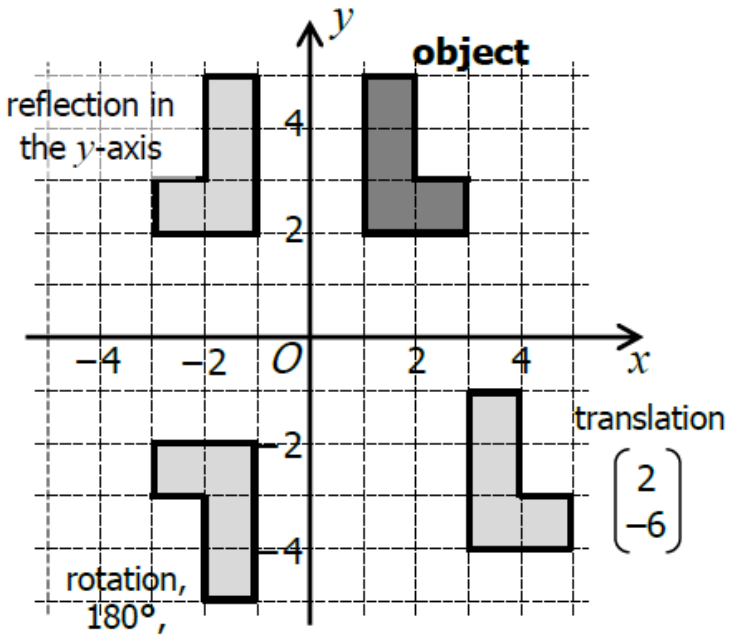
Herts for Learning

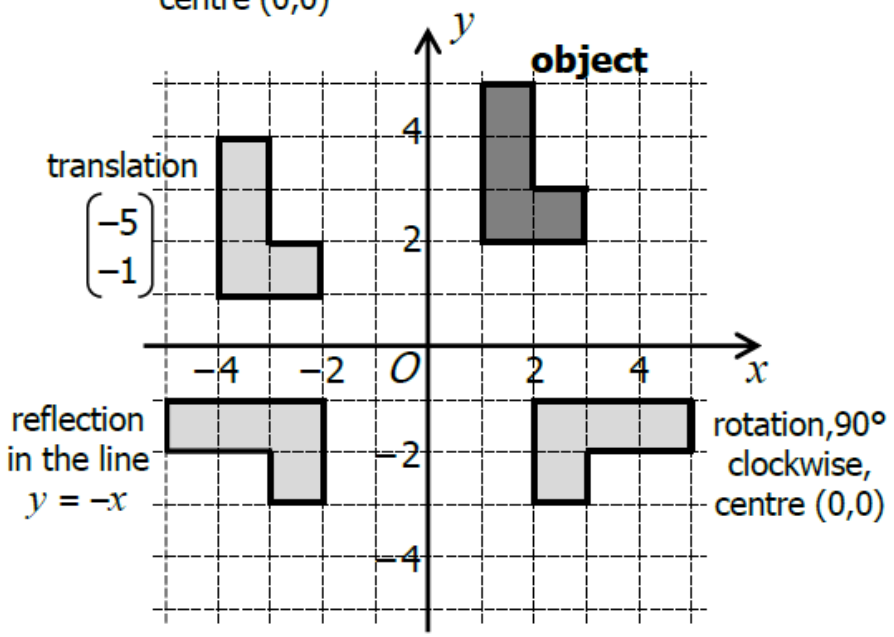
Memory Round

Fourth and final viewing of poster coming up!

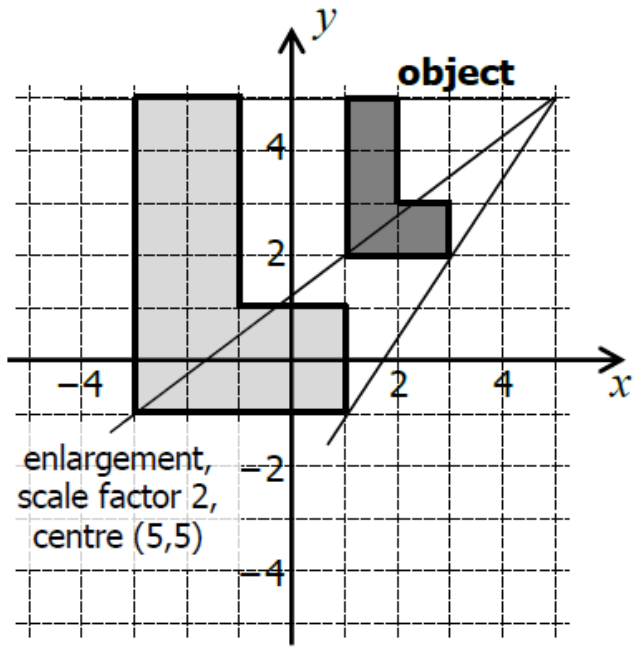
TRANSFORMATIONS

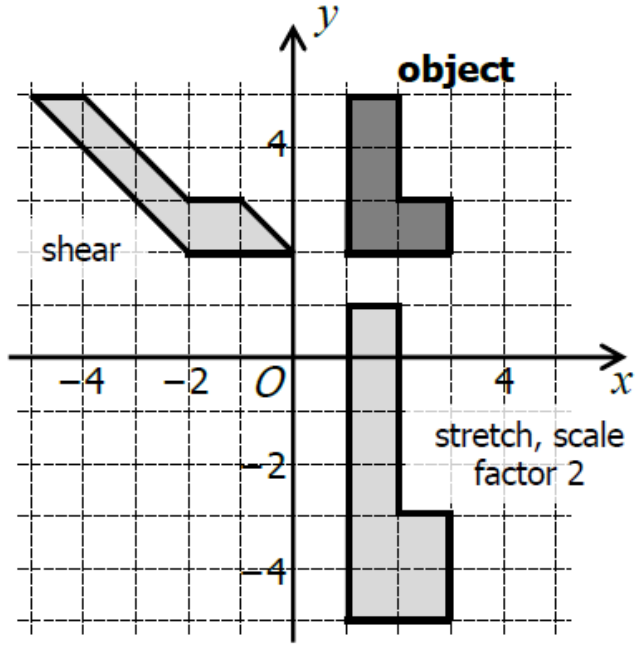
ISOMETRIES





OTHER TYPES





Round 2

Memory Round

Herts for Learning

Memory Round

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@hertsforlearning.co.uk

End of Round 2

Round 3

Estimation and Problem-Solving Round

Herts for Learning

Round 3

Question 1

Kara is 10,000,000 minutes old today.

Estimate her current age, in years.

Round 3

Question 2

The area of Wales is **20,735 km²**.

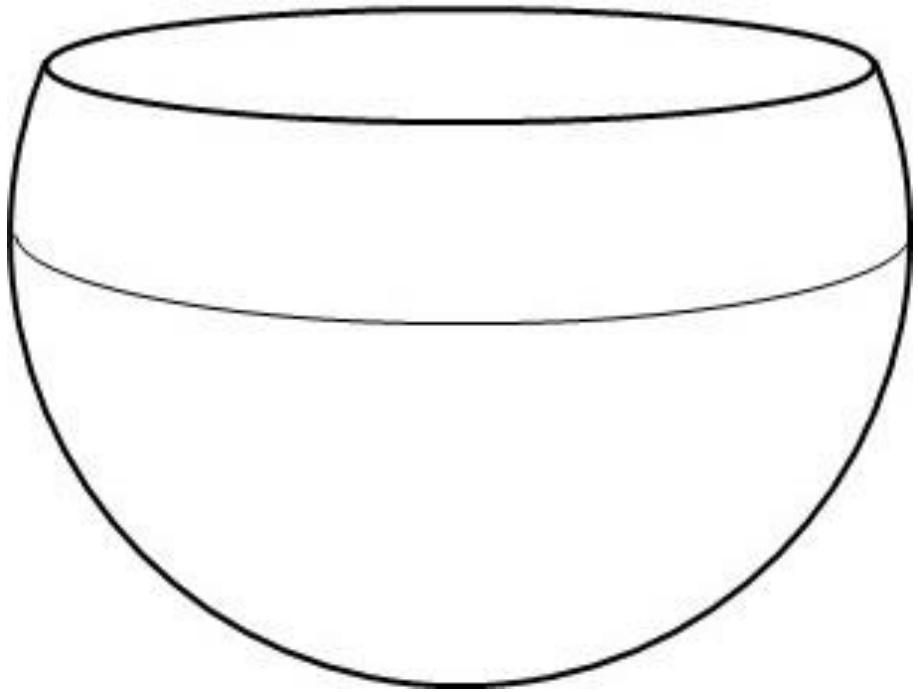
Estimate the area of England.

Round 3

Question 3

This is a **truncated sphere**.

It is a sphere whose top has been cut off.



Before the top was cut off, the volume of the sphere was **800 cm³**.

Estimate the volume of the truncated sphere, in cm³.

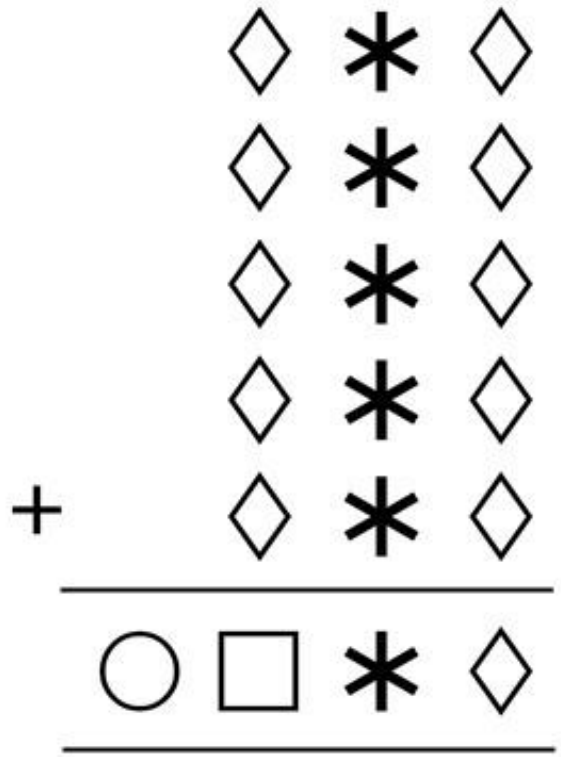
Round 3

Question 4

Here is an addition calculation.

There are **four** different symbols in the calculation.

Each symbol stands for a **different digit**.



What is the answer to the sum?

(Give the answer using normal digits.)

Round 3

Question 5

40 teams enter a football tournament.

To start with, they are divided into 8 groups of 5.
In each group, teams play each other team exactly once.

After the group stage, the top two teams from each group go through to the last 16, the start of the 'knockout' stage.

The 8 winners from the last 16 go through to the quarter-finals.
The winners of the quarter-finals go through to the semi-finals.
The winners of the semi-finals play each other in the final.

(There is no play-off for third place.)

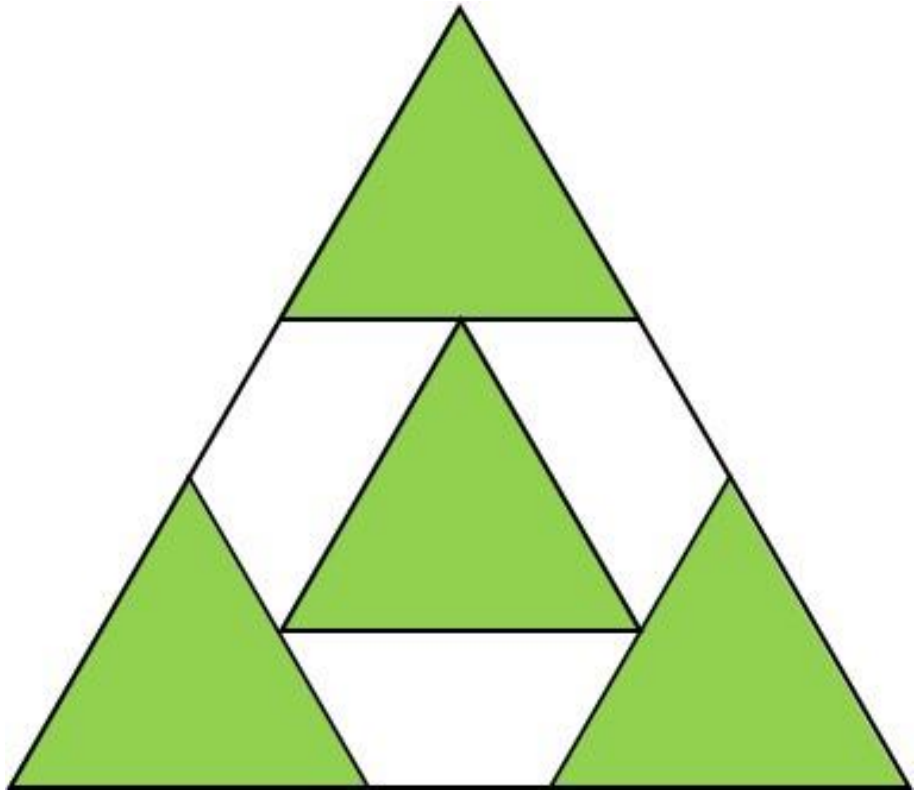
How many matches take place in the tournament altogether?

Round 3

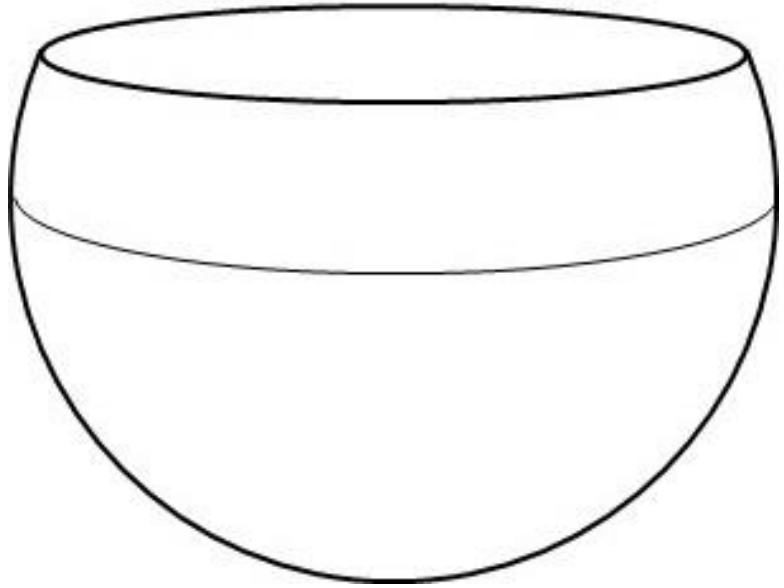
Question 6

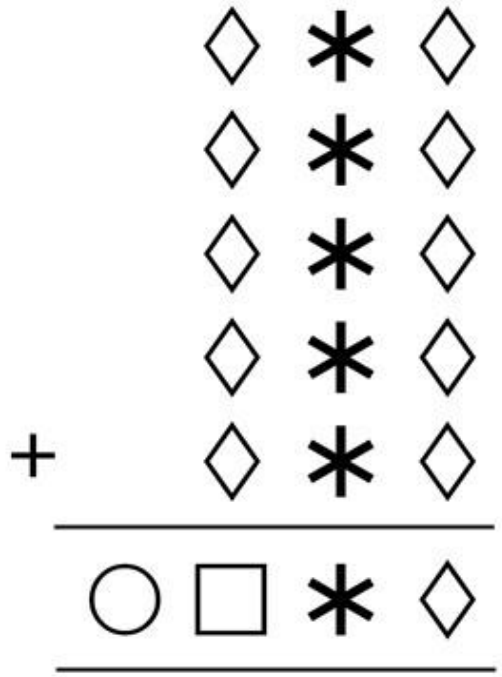
The diagram shows an equilateral triangle, with four shaded equilateral triangles inside.

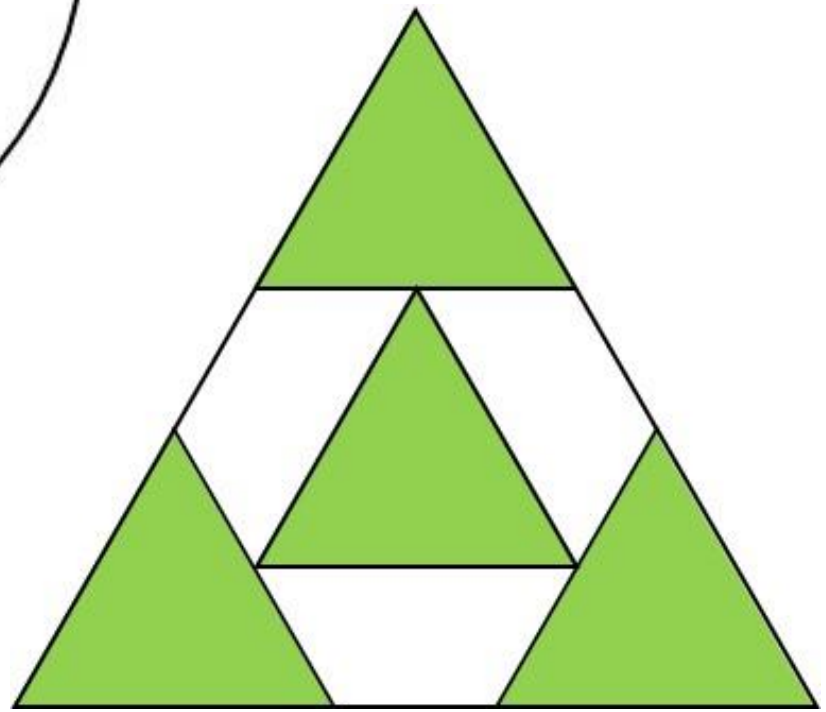
The shaded triangles are all the same size.



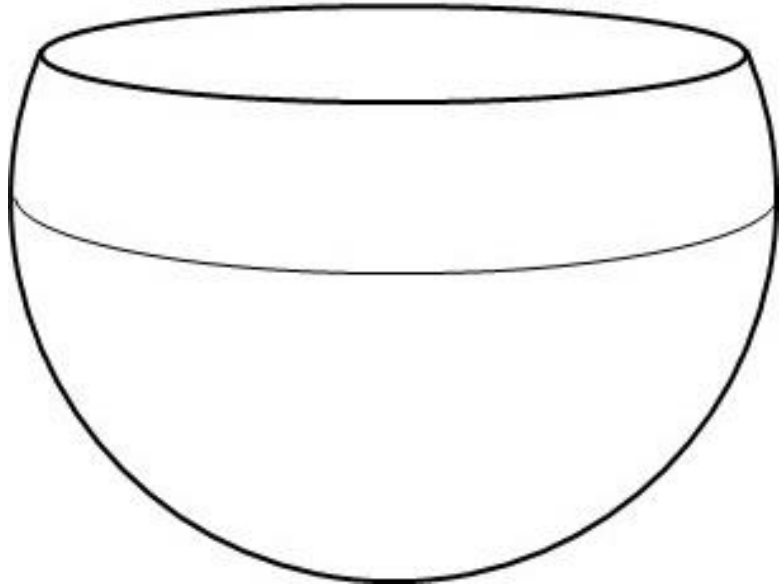
What percentage of the large equilateral triangle is shaded?

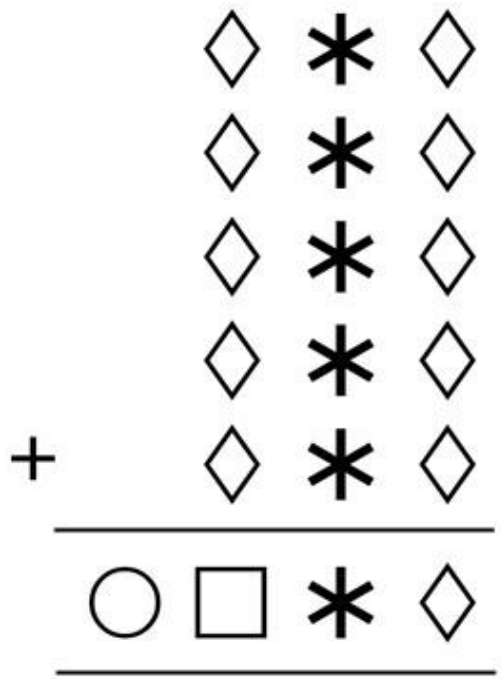


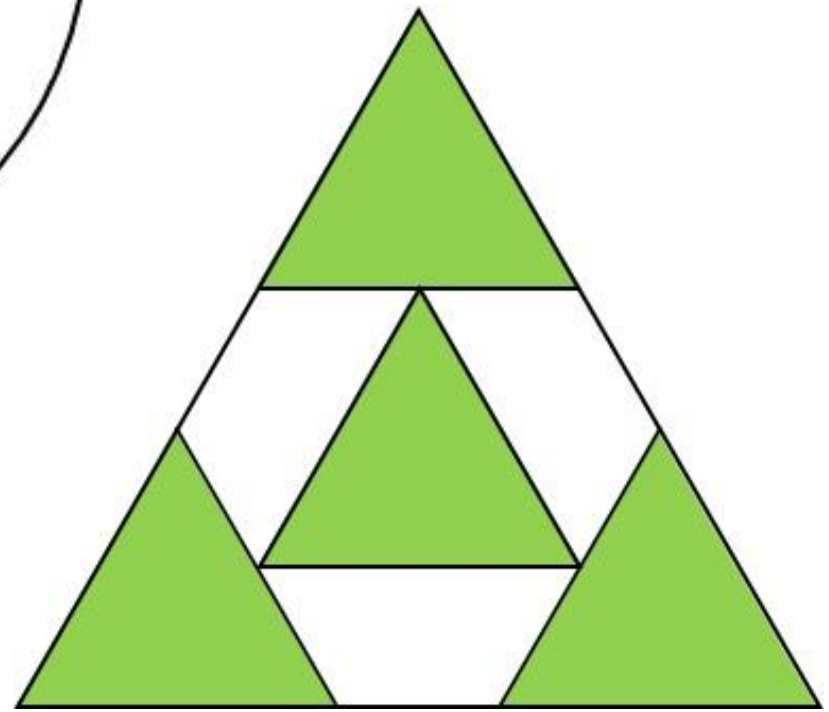




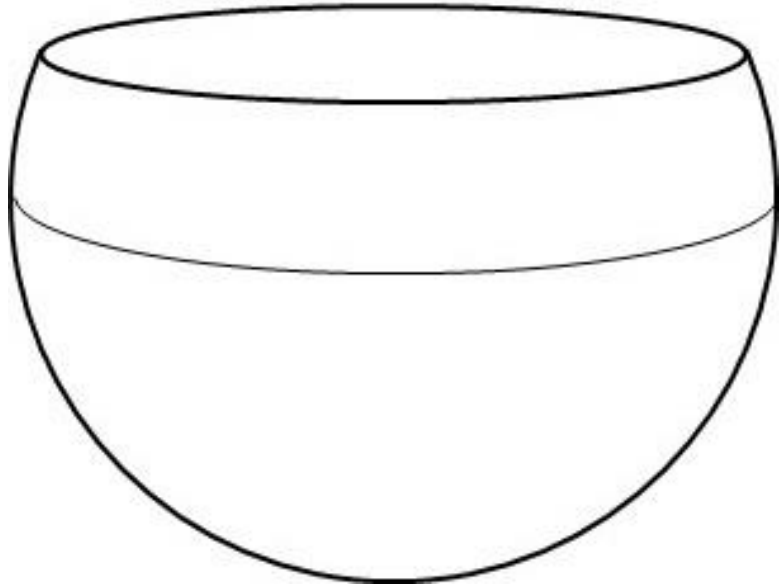
Round 3

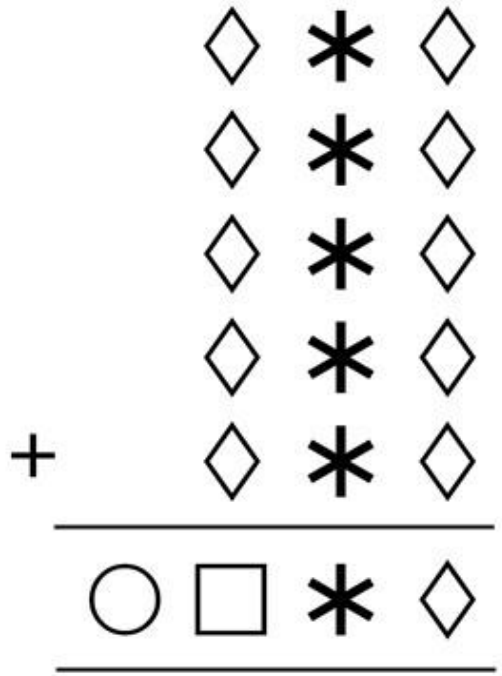


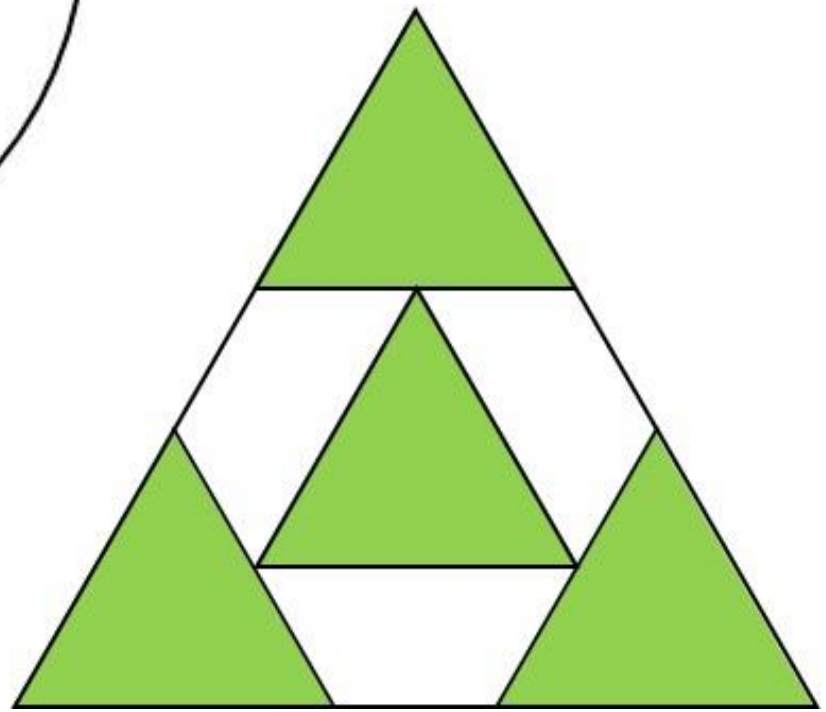




Less than 5 minutes left







Less than 1 minute left

End of Round 3

Round 3

ANSWERS

Round 3 **Question 1**

Kara is 10,000,000 minutes old today.

Estimate her current age, in years.

19

Round 3 **Question 2**

The area of Wales is **20,735 km²**.

Estimate the area of England.

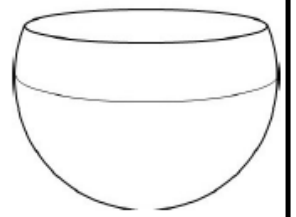
117,000 to 143,000 km²

Round 3 **Question 3**

This is a **truncated sphere**.

It is a sphere whose top has been cut off.

Before the top was cut off, the volume of the sphere was **800 cm³**.



Estimate the volume of the truncated sphere, in cm³.

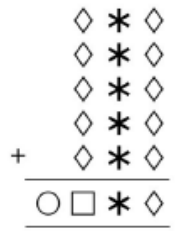
590 to 650 cm³

Round 3 **Question 4**

Here is an addition calculation.

There are **four** different symbols in the calculation.

Each symbol stands for a **different digit**.



What is the answer to the sum?

(Give the answer using normal digits.)

2,875

Round 3 **Question 5**

40 teams enter a football tournament.

To start with, they are divided into 8 groups of 5.
In each group, teams play each other team exactly once.

After the group stage, the top two teams from each group go through to the last 16, the start of the 'knockout' stage.

The 8 winners from the last 16 go through to the quarter-finals.
The winners of the quarter-finals go through to the semi-finals.
The winners of the semi-finals play each other in the final.

(There is no play-off for third place.)

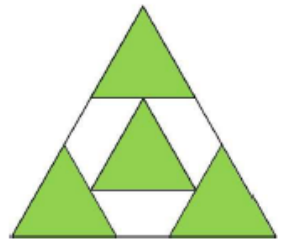
How many matches take place in the tournament altogether?

95

Round 3 **Question 6**

The diagram shows an equilateral triangle, with four shaded equilateral triangles inside.

The shaded triangles are all the same size.



What percentage of the large equilateral triangle is shaded?

64%

Round 4

General Mathematics Questions

Herts for Learning

Round 4

Question 1

In ancient Egypt, it was the custom to express fractions as the sum of unit fractions. For example:

$$\frac{5}{12} = \frac{1}{3} + \frac{1}{12}$$

Find a **different** way to express $\frac{5}{12}$ as the sum of two unit fractions.

That is: $\frac{5}{12} = \frac{1}{a} + \frac{1}{b}$ for integers a and b.

Round 4

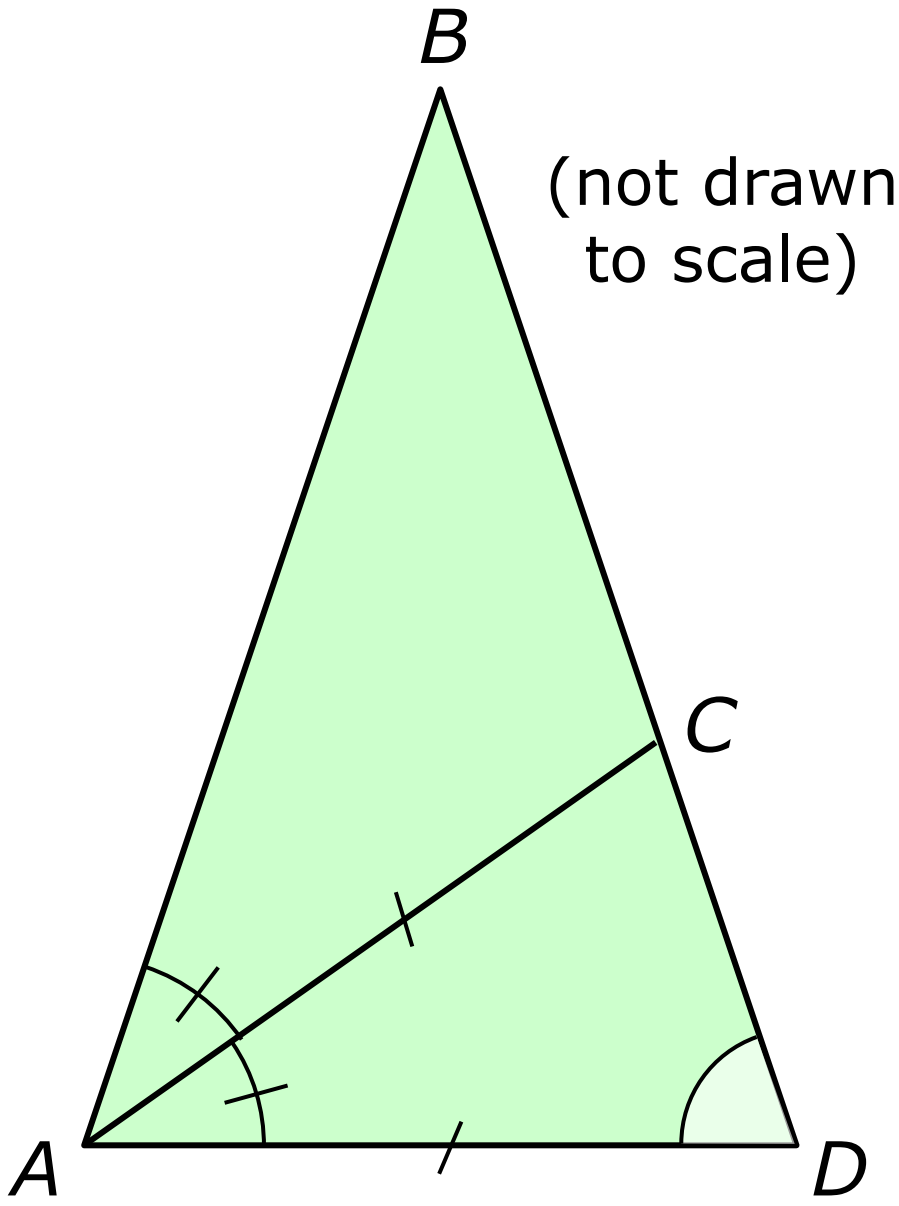
Question 2

Triangle ABD is isosceles.

Triangle ACD is also isosceles.

$\angle BAC = \angle CAD$.

Calculate the size of $\angle CDA$, in degrees



Round 4

Question 3

If you increase A by 20%, you get B.

If you increase B by 25%, you get C.

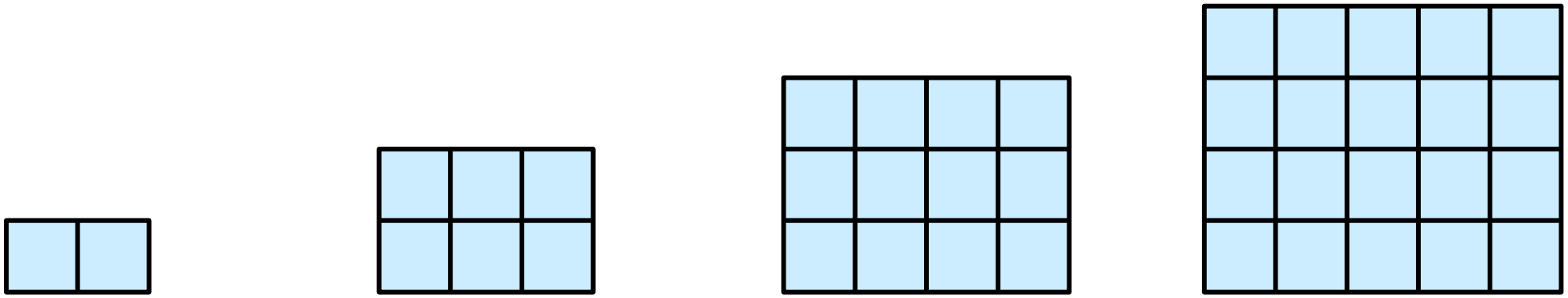
If you increase C by 40%, you get D.

By what **single** percentage must you increase A to get D?

Round 4

Question 4

Here is the start of a sequence of patterns.
Each pattern is made from squares.



Pattern 1 **Pattern 2** **Pattern 3** **Pattern 4**

How many squares will there be in Pattern 100?

Round 4

Question 5

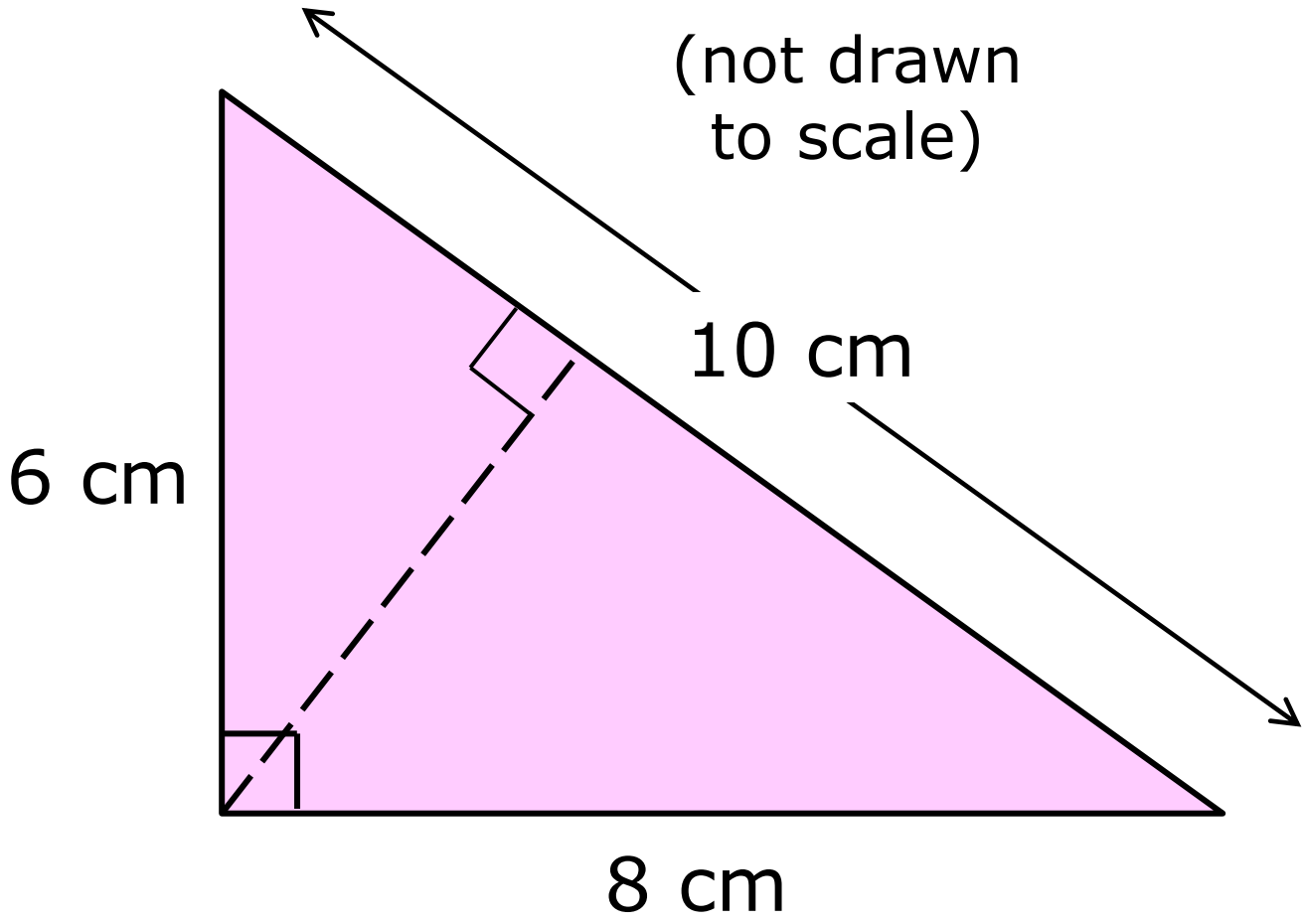
Find integers x, y and z which satisfy this equation:

$$7^x + 2^y = 4^z + 1$$

(x, y and z should all be different.)

Round 4

Question 6



In the diagram, a right-angled triangle has been divided into two different-sized right-angled triangles.

Work out the length of the broken line.

End of Round 4

Year 7 Mathematics Challenge Final 2021

Please finalise your answer spreadsheet as quickly as possible.

Please include the school/team name in the file name, and e-mail it to:

william.thallon@hertsforlearning.co.uk

Round 4

ANSWERS

Round 4 **Question 1**

In ancient Egypt, it was the custom to express fractions as the sum of unit fractions. For example:

$$\frac{5}{12} = \frac{1}{3} + \frac{1}{12}$$

Find a **different** way to express $\frac{5}{12}$ as the sum of two unit fractions.

That is: $\frac{5}{12} = \frac{1}{a} + \frac{1}{b}$ for integers a and b.

$a = 4, b = 6$

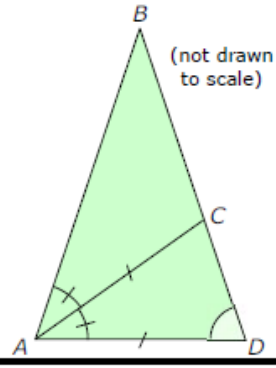
Round 4 **Question 2**

Triangle ABD is isosceles.

Triangle ACD is also isosceles.

$\angle BAC = \angle CAD$.

Calculate the size of $\angle CDA$, in degrees



72°

Round 4 **Question 3**

If you increase A by 20%, you get B.

If you increase B by 25%, you get C.

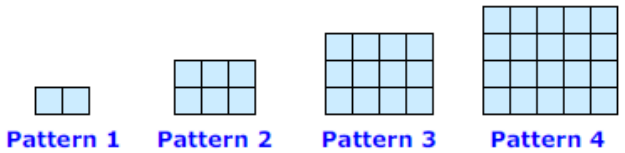
If you increase C by 40%, you get D.

By what **single** percentage must you increase A to get D?

110%

Round 4 **Question 4**

Here is the start of a sequence of patterns.
Each pattern is made from squares.



How many squares will there be in Pattern 100?

10,100

Round 4 **Question 5**

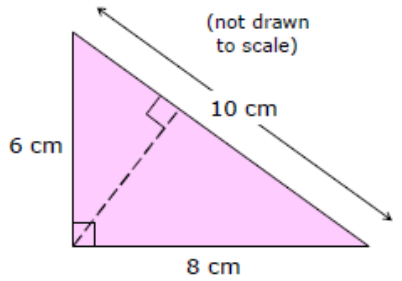
Find integers x, y and z which satisfy this equation:

$$7^x + 2^y = 4^z + 1$$

(x, y and z should all be different.)

$x = 2, y = 4, z = 3$

Round 4 **Question 6**



In the diagram, a right-angled triangle has been divided into two different-sized right-angled triangles.

Work out the length of the broken line.

4.8 cm

Year 7 Mathematics Challenge Final 2021

Marking in progress

Year 7 Mathematics Challenge Final 2021

Results imminent!

Well done to all

Year 7 Mathematics Challenge 2021

Final, Wednesday 9th June 2021

via *Livestorm*

William Thallon

Teaching and Learning Adviser (Secondary Maths)

David Cook

Lead Teaching and Learning Adviser (Primary Maths)

@HfLSecMaths

Herts for Learning