Year 8 Mathematics Challenge 2022

Final, Thursday 19th May 2022

Marriotts School, Stevenage

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Format of Challenge

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 phones, Internet etc!
- You will have an Answer Sheet for Rounds 1, 3 and 4, which will be handed in at the end of each round.
- Include **units** where necessary.

Round 1

General Mathematics Questions

Year 8 Mathematics Challenge Final

Round 1 – Answer Sheet

General Mathematics Questions

Team:	

Question	**Answer**		
1	Number of games is:		
2	**Graph A**	**Graph B**	**Graph C**
3	Volume of cuboid is:		
4	Co-ordinates are: (,)		
5	Cost of cheese is:		
6	Number in top left-hand corner is:		

Round 1

Question 1

15 hockey teams play in a league.

Each team plays every other team exactly once.

How many games take place in the league altogether?

Round 1

Question 2

P, **Q**, **R**, **S** and **T** represent people standing in a local council election.

On your handout, you have a table showing the votes in five districts.

	District 1	District 2	District 3	District 4	District 5
P	301	580	565	106	677
Q	523	483	306	409	428
R	663	400	209	515	388
S	515	490	156	417	460
T	306	575	387	121	684

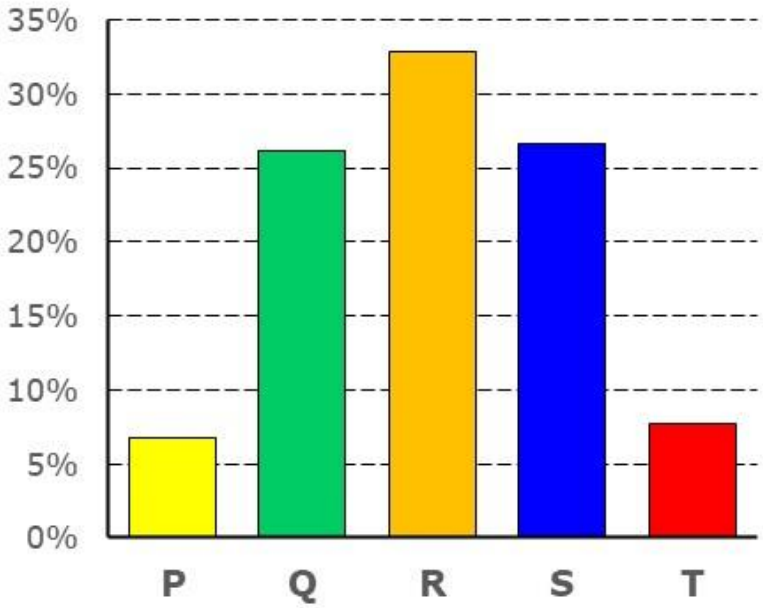
On the next slide, there are three graphs. Each graph represents one of the districts on your handout.

Which district does each graph represent?

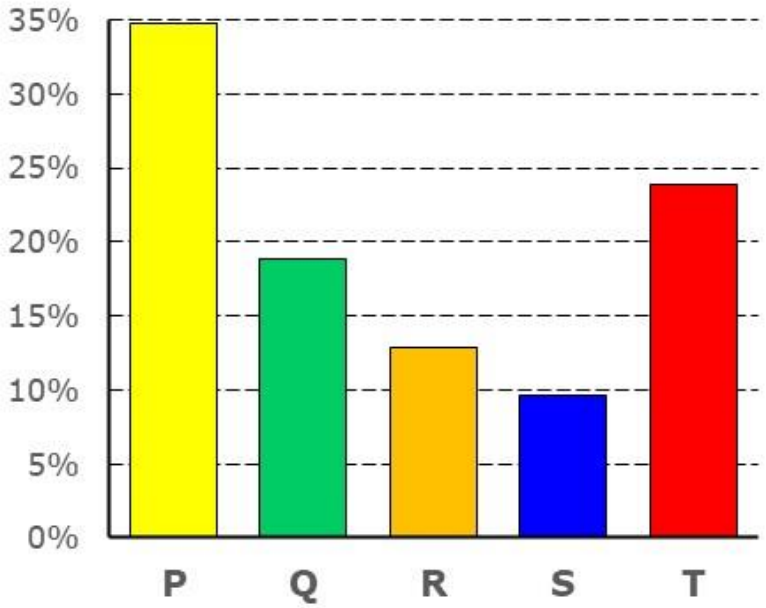
Round 1

Question 2

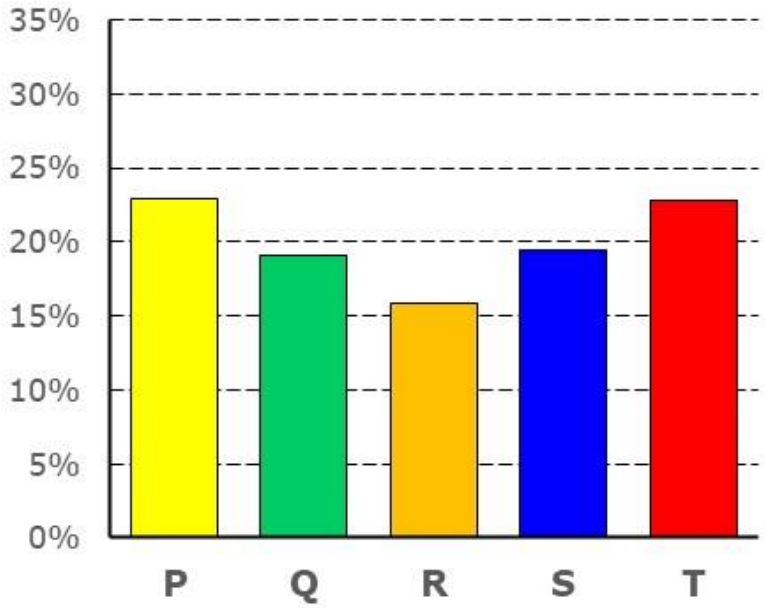
Graph A



Graph B



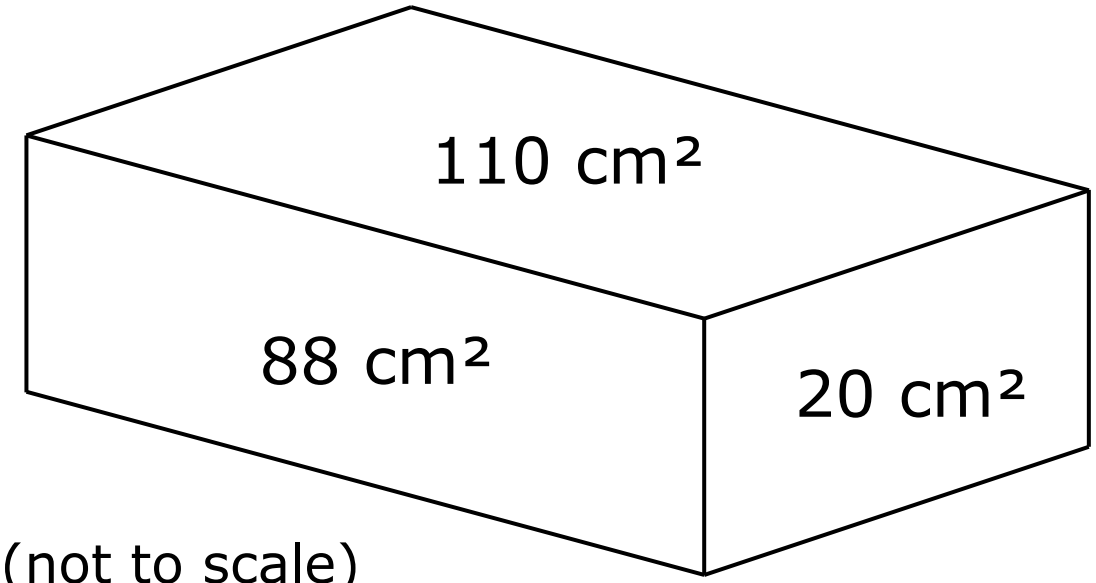
Graph C



Which district does each graph represent?

Round 1

Question 3



(not to scale)

Here is a cuboid.
The areas of three of the faces are given.

What is the volume of the cuboid?

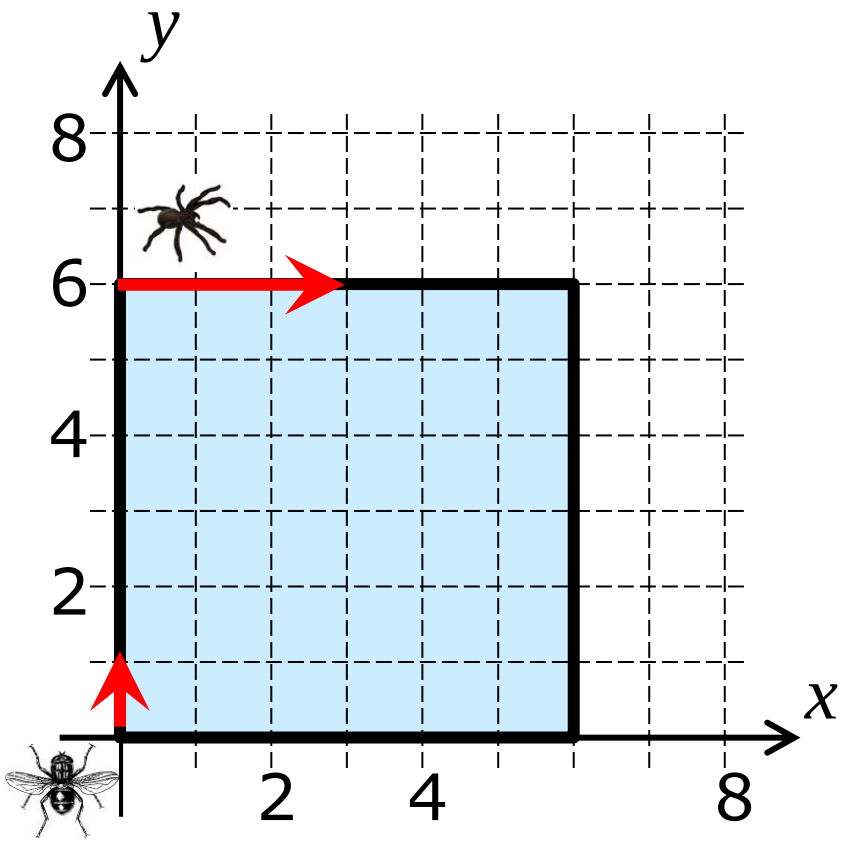
Round 1

Question 4

A spider is chasing a fly **clockwise** around the perimeter of this square.

The spider starts at the point (0,6) and the fly starts at the point (0,0).

The spider is walking three times faster than the fly.

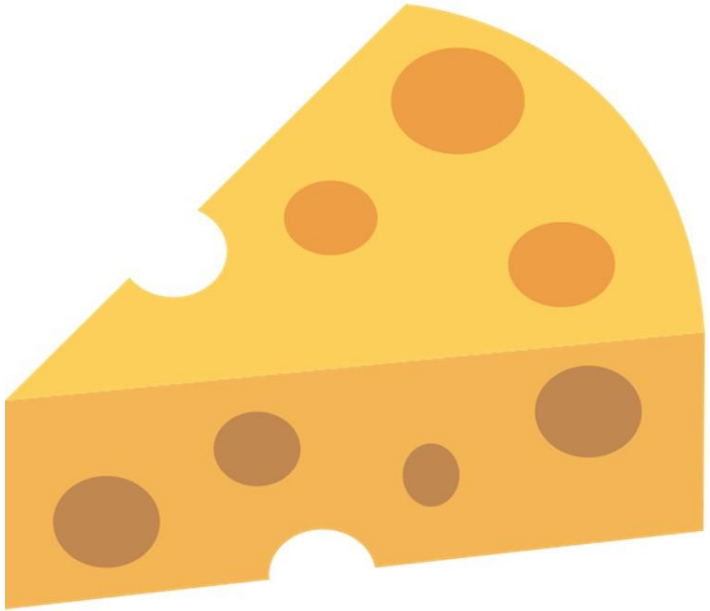


At what co-ordinates does the spider catch up with the fly?

Round 1

Question 5

$1\frac{2}{3}$ kg of cheese costs £18.



What is the cost of $\frac{4}{5}$ kg of the same cheese?

Round 1

Question 6

Here is a Hundred Square.

A 2 by 2 square is chosen on the grid.

The sum of the numbers in the square is **110**.

The sum of the numbers in a **different** 2 by 2 square is **290**.

What number is in the top left-hand corner of this square?

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

End of Round 1

Round 1

ANSWERS

Round 1 **Question 1**

15 hockey teams play in a league.

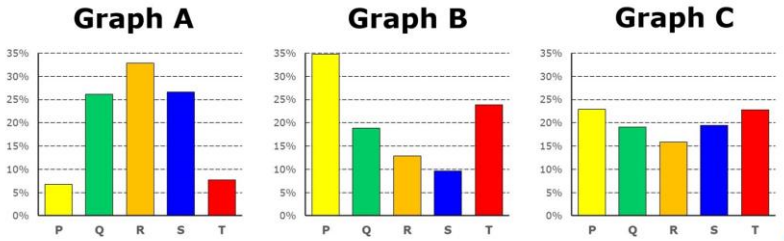
Each team plays every other team exactly once.

How many games take place in the league altogether?

6 © Herts for Learning

105

Round 1 **Question 2**

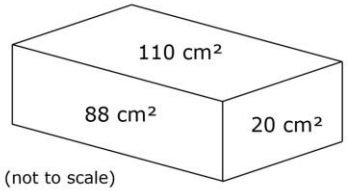


Which district does each graph represent?

8 © Herts for Learning

A4 B3 C2

Round 1 **Question 3**



Here is a cuboid.
The areas of three of the faces are given.

What is the volume of the cuboid?

9 © Herts for Learning

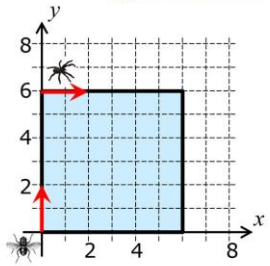
440 cm³

Round 1 **Question 4**

A spider is chasing a fly **clockwise** around the perimeter of this square.

The spider starts at the point (0,6) and the fly starts at the point (0,0).

The spider is walking three times faster than the fly.



At what co-ordinates does the spider catch up with the fly?

10 © Herts for Learning

(3,6)

Round 1 **Question 5**

$1\frac{2}{3}$ kg of cheese costs £18.

What is the cost of $\frac{4}{5}$ kg of the same cheese?

11 © Herts for Learning

£8.64

Round 1 **Question 6**

Here is a Hundred Square.

A 2 by 2 square is chosen on the grid.

The sum of the numbers in the square is **110**.

The sum of the numbers in a **different** 2 by 2 square is **290**.

What number is in the top left-hand corner of this square?

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

67

Round 2

Memory Round

Memory Round

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.

Memory Round

The poster will be shown to the observers so that the scribes 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.

Memory Round

Tip for observers

Don’t try to memorise the whole thing at once. Memorise a section at a time.

Tips and instructions for scribes

The poster is in landscape orientation.

No rulers allowed: pencils and rubbers only.

Memory Round

One minute to get ready, decide who will be observers and who will be the scribes, and discuss strategy.

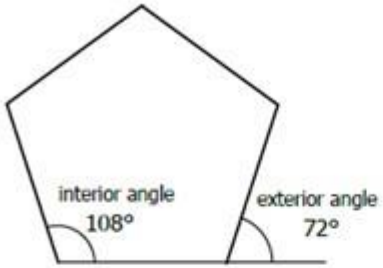
Round 2

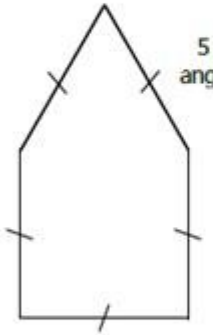
Memory Round

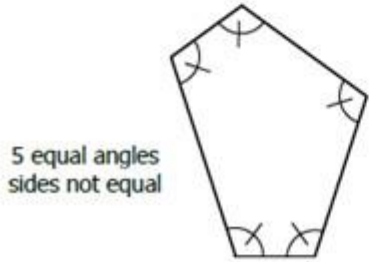
End of Round 2

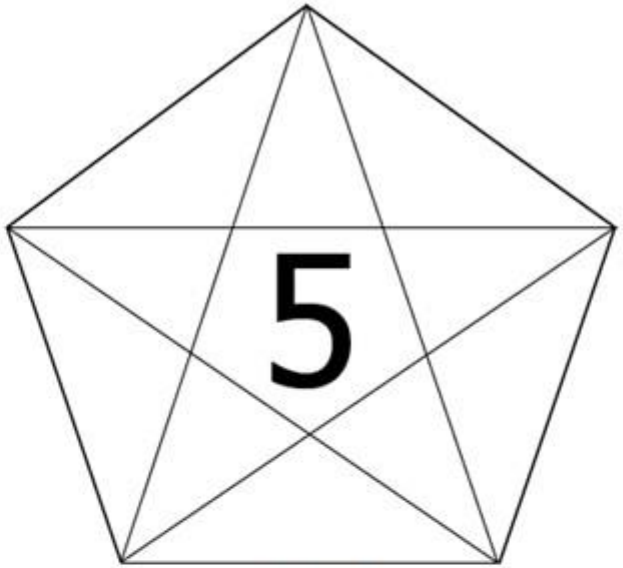
Round 2
ANSWER

PENTAGONS









Pentagram

Penta = 5 in ancient Greek

(e.g. 'Pentathlon' = contest with 5 different events)

FIVE

- arms on a starfish
- human senses
- digits on a hand or toes on a foot
- Olympic rings
- gold rings
- lines in a limerick
- vowels in the alphabet

Quinque = 5 in Latin

(e.g. 'Quintuplets' = 5 children in one birth)

POWERS

Power	Reciprocal	Decimal
$5^1 = 5$	$\frac{1}{5}$	0.2
$5^2 = 25$	$\frac{1}{25}$	0.04
$5^3 = 125$	$\frac{1}{125}$	0.008
$5^4 = 625$	$\frac{1}{625}$	0.0016

powers of 5 always end in 5

n	n^5
1	1
2	32
3	243
4	1024
5	3125

n^5 always ends in the same digit as n

Sum of two squares	Difference of two squares
$5 = 1^2 + 2^2$	$5 = 3^2 - 2^2$
$5^2 = 3^2 + 4^2$	$5^2 = 13^2 - 12^2$

Round 3

Estimation and Problem-Solving

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Round 3 – Answer Sheet

Estima

Team:	

Question	**Answer**
1	Number of pape
2	Mass of tin:
3	Perimeter of Isl

Question 4

Complete this table using each of the numbers from 1 to 16 exactly once:

	Prime	**Square**	**Consecutive**	**Greater than 9**
Odd				
Triangular				
Add to 38				
Even				

Question 5

Find as many fractions as you can:

- whose denominator is two more than its numerator
- whose percentage equivalent is an integer

Example: $\frac{6}{8}$ (the percentage equivalent is 75%)

Question 6

Use the dotty grids below to draw as many different trapeziums as you can.
Draw one shape on each grid.

Round 3

Question 1

There are 20 paperclips in the jar.

How many paperclips would it take to fill the jar?

Round 3

Question 2

The mass of the candle is 12 grams

Estimate the mass of the tin.

Round 3

Question 3

Estimate the **perimeter** of the Isle of Man in kilometres.

Round 3

Questions 1 to 3

Question 1

How many paperclips would it take to fill the jar?

Question 2

The mass of the candle is 12 grams

Estimate the mass of the tin.

Question 3

Estimate the **perimeter** of the Isle of Man, in km.

Round 3

Question 4

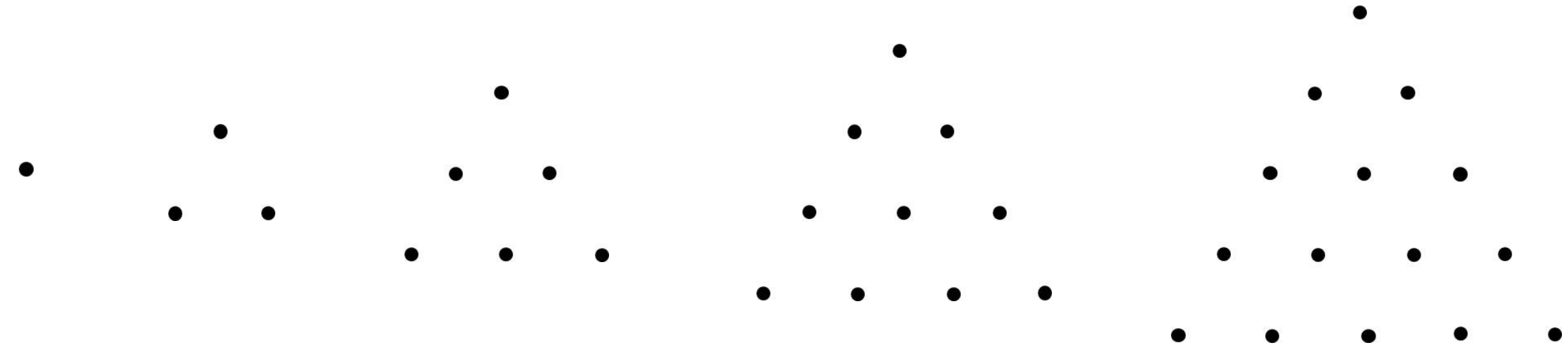
Using each of the numbers from 1 to 16 exactly once, complete this table.

	Prime	Square	Consecutive	Greater than 9
Odd				
Triangular				
Add to 38				
Even				

Round 3

Question 4

The triangular numbers are:



1 3 6 10 15

Round 3

Question 5

Find as many fractions as you can:

- whose denominator is two more than its numerator; and
- whose percentage equivalent is an integer (not including 0).

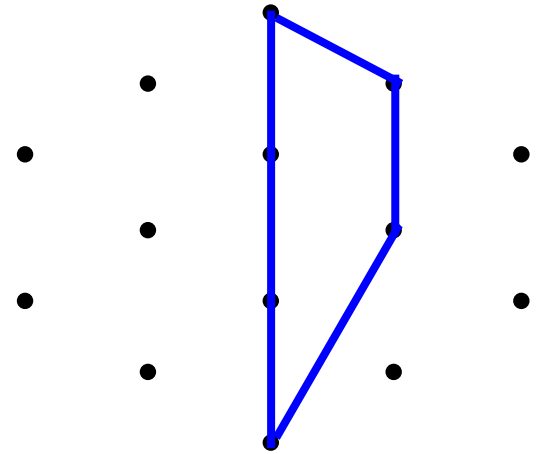
Example: $\frac{6}{8} = 75\%$

(You just have to write the fraction, not the percentage.)

Round 3

Question 6

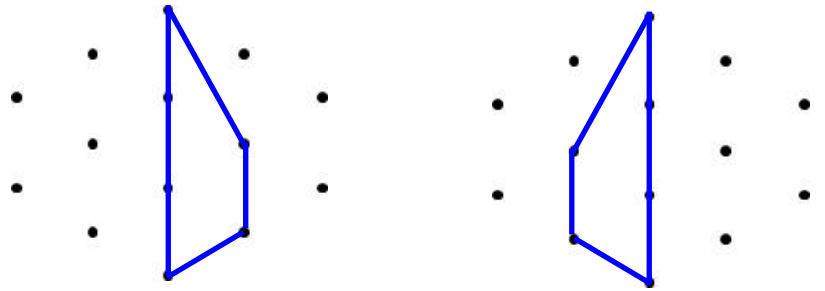
On the Answer Sheet, you have ten dotty grids like this.



Here is a trapezium you can draw on the grid. All the vertices are at dots on the grid.

Including this example, how many **different** trapeziums can you draw?

Note that these two trapeziums are the same as the one in the example:



Round 3

Questions 4 to 6

Question 4

Complete the table, using all the numbers from 1 to 16 inclusive.

	Prime	Square	Consecutive	Greater than 9
Odd				
Triangular				
Add to 38				
Even				

Question 5

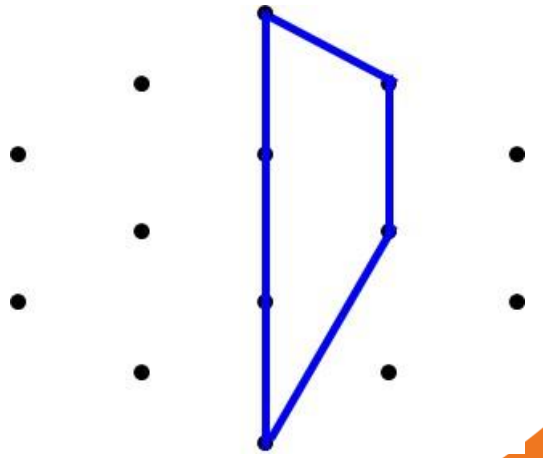
Find as many fractions as you can:

- whose denominator is two more than its numerator
- whose percentage equivalent is an integer

e.g. $\frac{6}{8}$

Question 6

How many different trapeziums?



End of Round 3

Round 3

ANSWERS

Round 3 **Question 1**

There are 20 paperclips in the jar.

How many paperclips would it take to fill the jar?

26 © Herts for Learning

560 to 690

Round 3 **Question 2**

The mass of the candle is 12 grams

Estimate the mass of the tin.

27 © He

390 g to 500 g

Round 3 **Question 3**

Estimate the **perimeter** of the Isle of Man in kilometres.

28 © Herts for Learning

160 km (±16)

Round 3 **Question 4**

Using each of the numbers from 1 to 16 exactly once, complete this table.

	Prime	Square	Consecutive	Greater than 9
Odd	11	9	5	15
Triangular	3	1	6	10
Add to 38	13	4	7	14
Even	2	16	8	12

30 © Herts for Learning

Round 3 **Question 5**

Find as many fractions as you can:

- whose denominator is two more than its numerator; and
- whose percentage equivalent is an integer

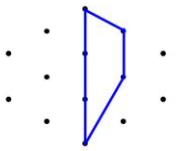
Example: $\frac{6}{8}$

32 © Herts for Learning

Round 3 **Question 6**

On the Answer Sheet, you have ten dotty grids like this.

Here is a trapezium you can draw on the grid. All the vertices are at dots on the grid.



Including this example, how many **different** trapeziums can you draw?

Note that these two trapeziums are the same as the one in the example:

33 © Herts for Learning

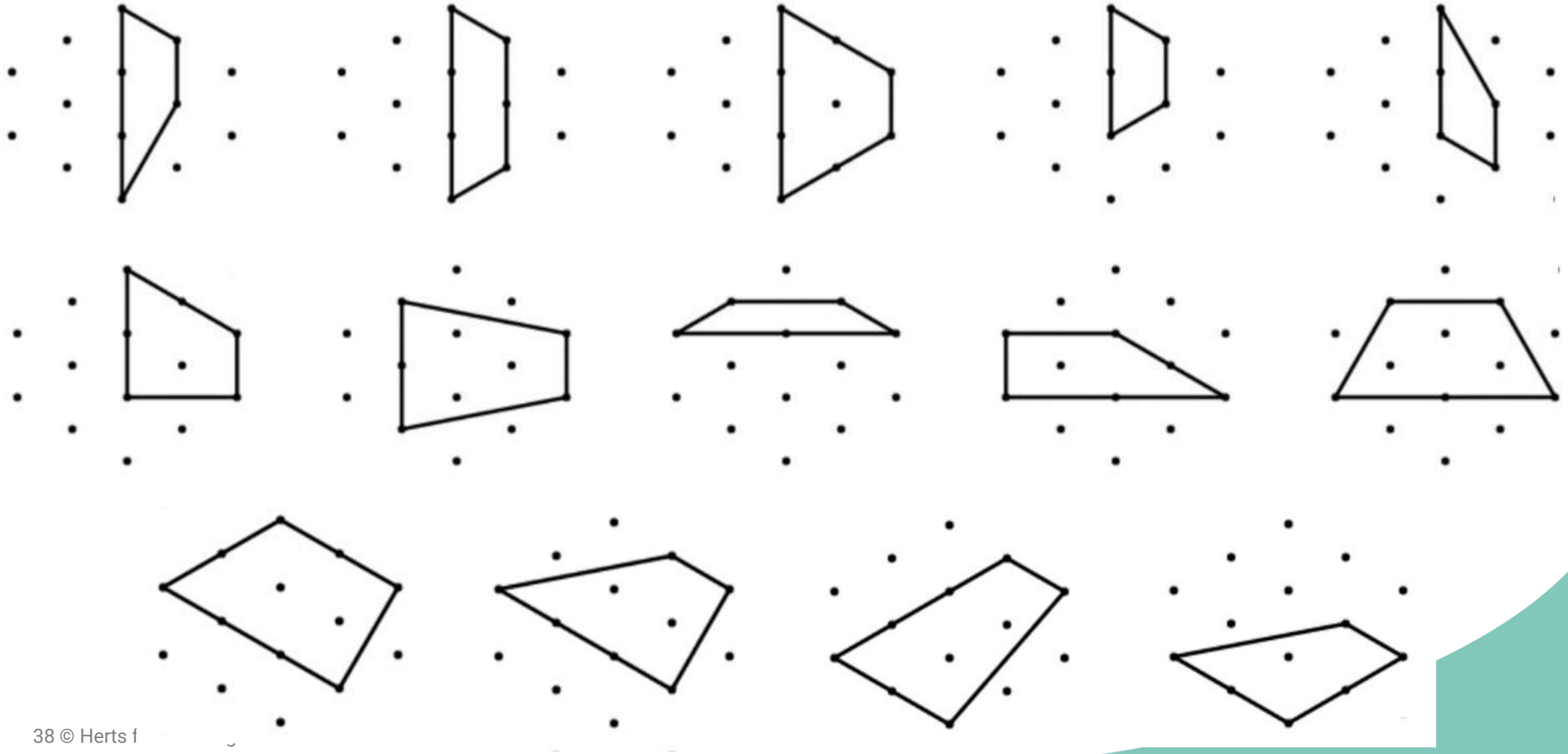
Round 3

Question 5

$\frac{2}{4}$	$\frac{3}{5}$	$\frac{6}{8}$	$\frac{8}{10}$	$\frac{18}{20}$	$\frac{23}{25}$	$\frac{38}{40}$	$\frac{48}{50}$	$\frac{98}{100}$	$\frac{198}{200}$
50%	60%	75%	80%	90%	92%	95%	96%	98%	99%

Round 3

Question 6



Round 4

General Mathematics Questions

Year 8 Mathematics Challenge Final

Round 4 – Answer Sheet

General Mathematics Questions

Team:	

Question	Answer	
1	Lowest of the integers is:	
2	Number of matchsticks needed:	
3	$a =$	$b =$
4	Percentage of sugar is:	
5	Yellow box:	Blue box:
6	$x =$	$y =$

Round 4

Question 1

a, b, c and d are consecutive integers.

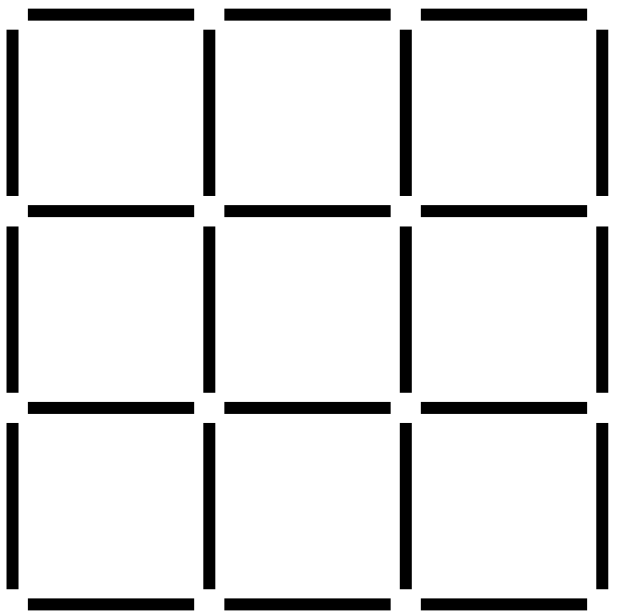
$$abcd = 1{,}680$$

What is the **lowest** of the four integers?

Round 4

Question 2

This 3 by 3 square is made using 24 matchsticks.



How many matchsticks would be needed to make a 100 by 100 square?

Round 4

Question 3

a and b are both decimal numbers.

$$a + b = 4$$

$$ab = 2.79$$

Find the values of a and b.

Round 4

Question 4

A ‘fruit pot’ is made from:

80% yoghurt
20% fruit sauce.

The fruit pot contains 6% sugar altogether.

The yoghurt contains 4% sugar.

What percentage of the fruit sauce is sugar?

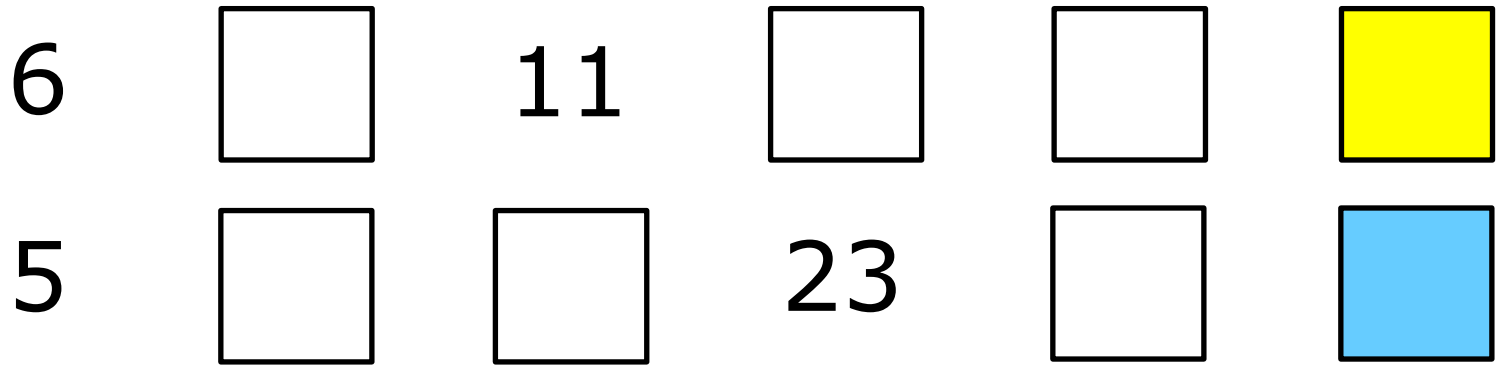
Round 4

Question 5

In a Fibonacci-type sequence, each term is the sum of the previous two terms. For example:

2 5 7 12 19 31 …

Here are two more Fibonacci-type sequences, this time with some numbers missing.

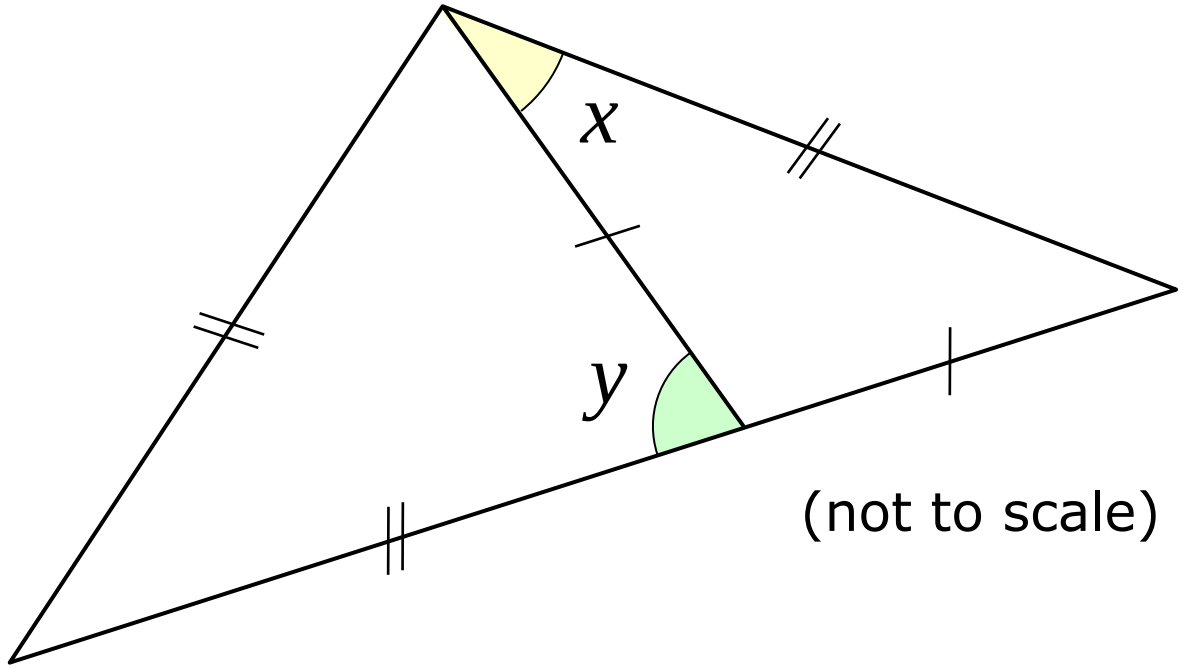


Work out the numbers in the yellow and blue boxes

Round 4

Question 6

All three triangles in this diagram are isosceles.



Work out the sizes of angles x and y.

End of Round 4

Round 4

ANSWERS

Round 4 **Question 1**

a, b, c and d are consecutive integers.

$abcd = 1{,}680$

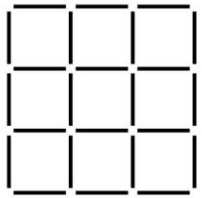
What is the **lowest** of the four integers?

40 © Herts for Learning

5

Round 4 **Question 2**

This 3 by 3 square is made using 24 matchsticks.



How many matchsticks would be needed to make a 100 by 100 square?

41 © Herts for Learning

20,200

Round 4 **Question 3**

a and b are both decimal numbers.

$a + b = 4$

$ab = 2.79$

Find the values of a and b.

42 © Herts for Learning

3.1 and 0.9

Round 4 **Question 4**

A 'fruit pot' is made from:

80% yoghurt
20% fruit sauce.

The fruit pot contains 6% sugar altogether.

The yoghurt contains 4% sugar.

What percentage of the fruit sauce is sugar?

43 © Herts for Learning

14%

Round 4 **Question 5**

In a Fibonacci-type sequence, each term is the sum of the previous two terms. For example:

2 5 7 12 19 31 ...

Here are two more Fibonacci-type sequences, this time with some numbers missing.

6 ☐ 11 ☐ ☐ ☐

5 ☐ ☐ 23 ☐ ☐

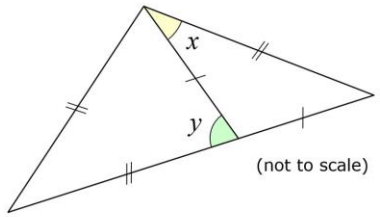
Work out the numbers in the yellow and blue boxes

44 © Herts for Learning

43 **60**

Round 4 **Question 6**

All three triangles in this diagram are isosceles.



Work out the sizes of angles x and y.

45 © Herts for Learning

$x = 36°$, $y = 72°$

Year 8 Mathematics Challenge 2022
FINAL

Marking in progress

Year 8 Mathematics Challenge 2022
FINAL

Results imminent!

Well done to all

Year 8 Mathematics Challenge 2022

Final, Thursday 19th May 2022

Marriotts School, Stevenage

William Thallon

Teaching and Learning Adviser (Secondary Maths)

David Cook

Lead Teaching and Learning Adviser (Primary Maths)

