Year 7 Mathematics Challenge 2022

Heat 1, Thursday 3rd March 2022

via *Livestorm*

William Thallon

Teaching and Learning Adviser (Secondary Maths)

David Cook

Lead Teaching and Learning Adviser (Primary Maths)

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.

Year 7 Challenge

This is the first of three heats. The final heat is taking place next Tuesday (8th March).

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 at Marriotts School in Stevenage on Wednesday 4th May.

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.

Round 1

General Mathematics Questions

Round 1

Question 1

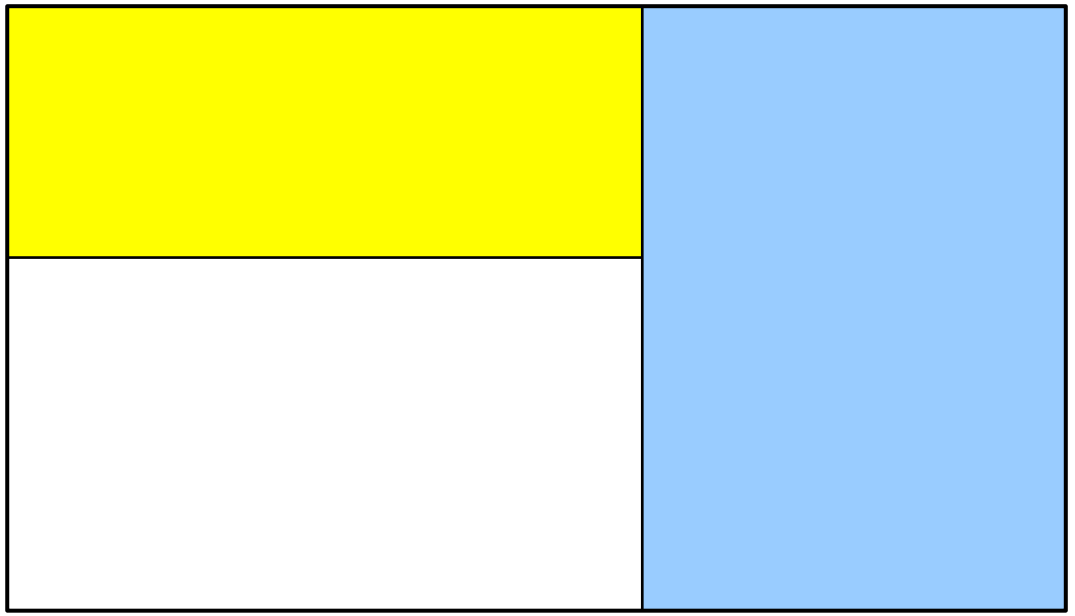
What is the **sum** of all the factors of 18?

Round 1

Question 2

$\frac{1}{4}$ of this rectangle is shaded yellow.

$\frac{2}{5}$ of the rectangle is shaded blue.



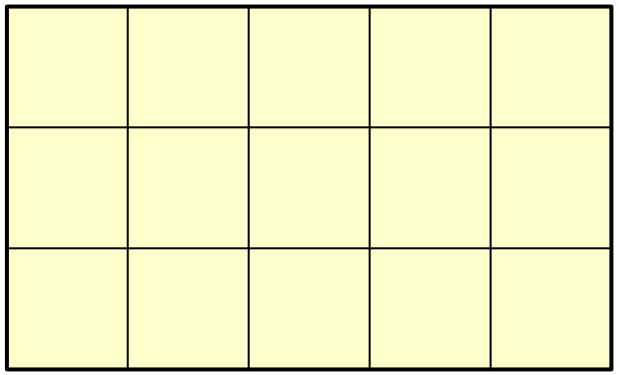
What percentage of the rectangle is unshaded?

Round 1

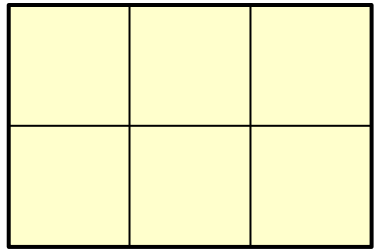
Question 3

A cuboid is made out of centimetre cubes.

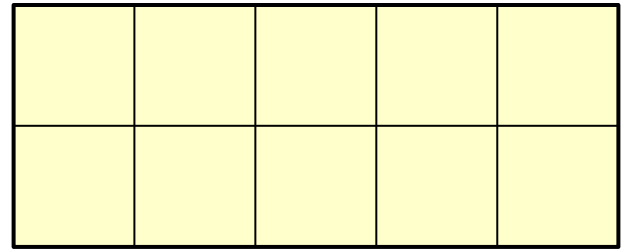
Here are the plan and elevations of the cuboid.



Plan
(view from above)



Front Elevation



Side Elevation

How many centimetre cubes does the cuboid contain?

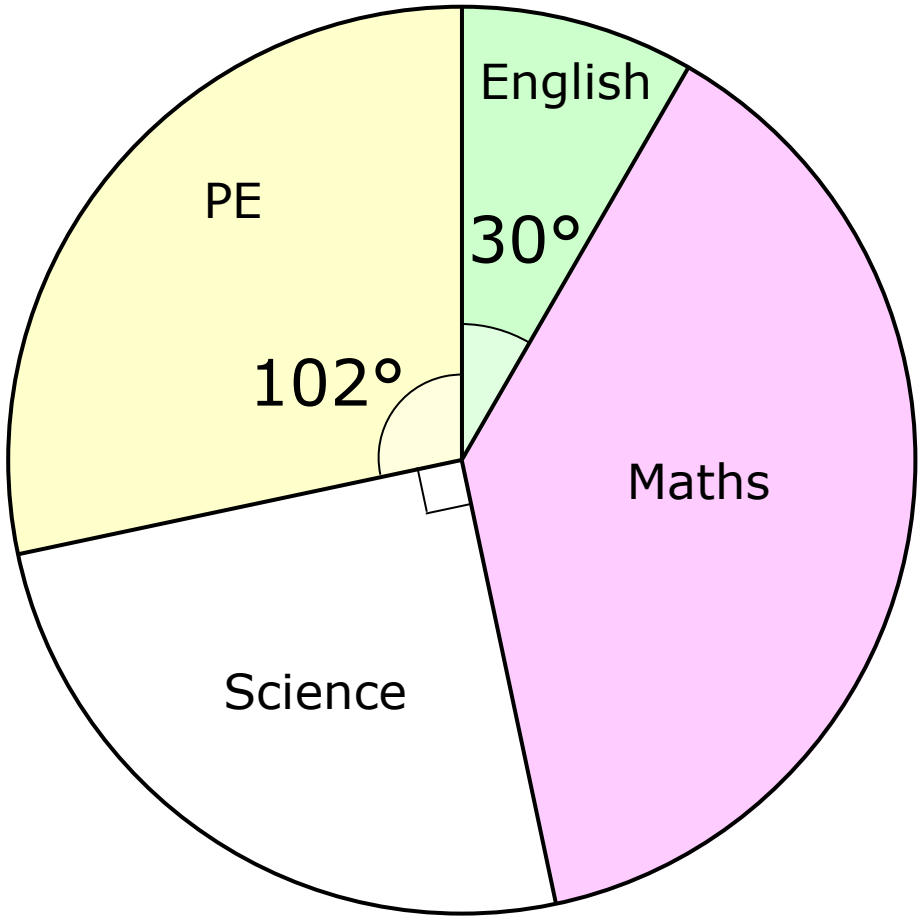
Round 1

Question 4

Some students were asked to name their favourite subject at school.

The results are shown in the pie chart. The angles of some of the sectors are shown.

5 students said **English**.



How many students said PE?

Round 1

Question 5

$$\frac{12}{x - 1} = 2$$

What is the value of x?

Round 1

Question 6

A bag contains:

20 red counters
10 blue counters
30 green counters

Apart from the colour, all the counters are identical.

Some counters are removed from the bag and not replaced.

What is the lowest number of counters that must be removed to be <u>certain</u> that **at least 5** of them are blue?

End of Round 1

Round 1

ANSWERS

Round 1 **Question 1**

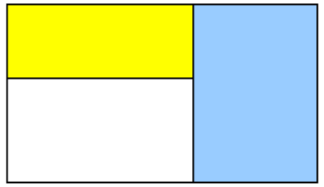
What is the **sum** of all the factors of 18?

39

Round 1 **Question 2**

$\frac{1}{4}$ of this rectangle is shaded yellow.

$\frac{2}{5}$ of the rectangle is shaded blue.



What percentage of the rectangle is unshaded?

35%

Round 1 **Question 3**

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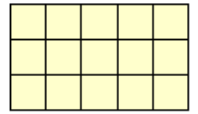
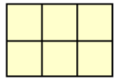
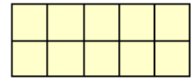
Here are the plan and elevations of the cuboid.



Plan
(view from above)



Front Elevation



Side Elevation

How many centimetre cubes does the cuboid contain?

30

Round 1 **Question 4**

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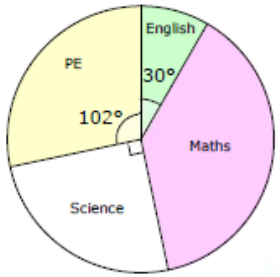
The results are shown in the pie chart. The angles of some of the sectors are shown.

5 students said **English**.



How many students said PE?

17

Round 1 **Question 5**

$$\frac{12}{x - 1} = 2$$

What is the value of x?

7

Round 1 **Question 6**

A bag contains:

20 red counters
10 blue counters
30 green counters

Apart from the colour, all the counters are identical.

Some counters are removed from the bag and not replaced.

What is the lowest number of counters that must be removed to be <u>certain</u> that **at least 5** of them are blue?

55

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 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.

Memory Round

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.)

Memory Round

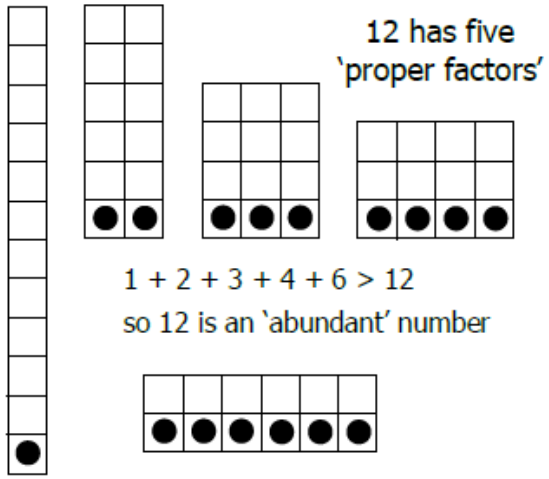
Pencils and rubbers only. No rulers or other drawing equipment.

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

Memory Round

Poster about to be displayed for the first time.

Twelve facts about the number 12



12 has five 'proper factors'

1 + 2 + 3 + 4 + 6 > 12

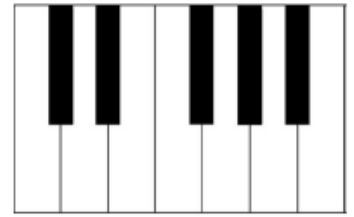
so 12 is an 'abundant' number

hours on a clockface

J	F	M
A	M	J
J	A	S
O	N	D

months in the year

old pence in a shilling



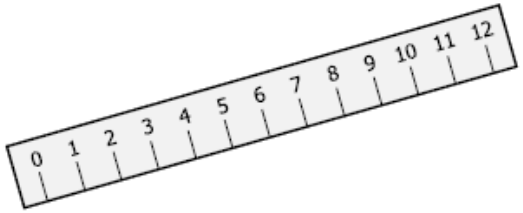
notes in an octave

XII I II III IV V VI VII VIII IX X XI

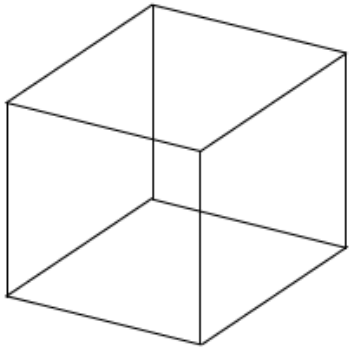
signs of the Zodiac

'do' = 2 (from Latin)
'zehn' = 10 (German)
} 'DOZEN' = 12

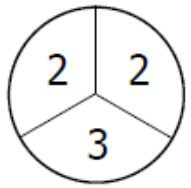
inches in a foot



number of edges on a cube



number of people who have walked on the Moon



Force 12 = hurricane force

Wind speeds over:

73 mph
118 km/h

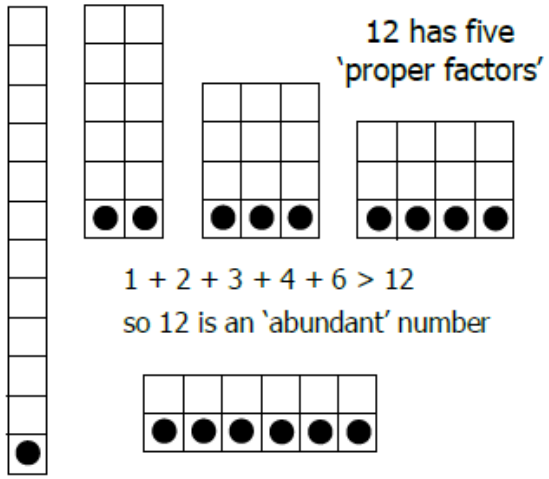
Round 2

Memory Round

Memory Round

Second viewing of poster coming up!

Twelve facts about the number 12



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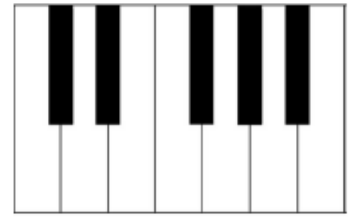

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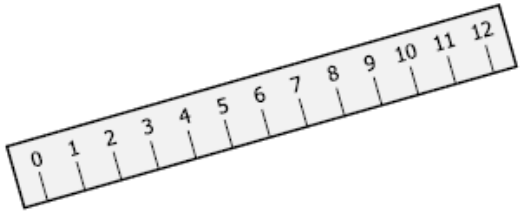

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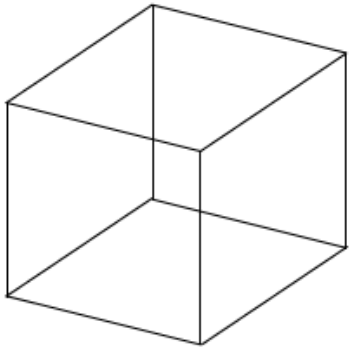

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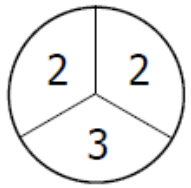

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Wind speeds over:

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118 km/h

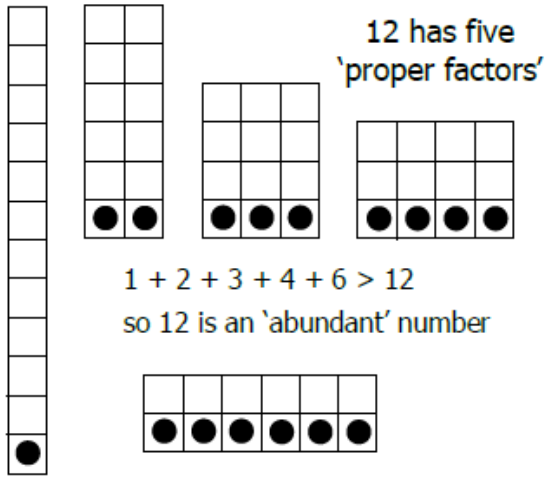
Round 2

Memory Round

Memory Round

Third viewing of poster coming up!

Twelve facts about the number 12



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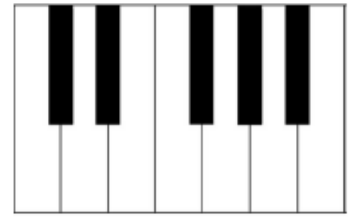

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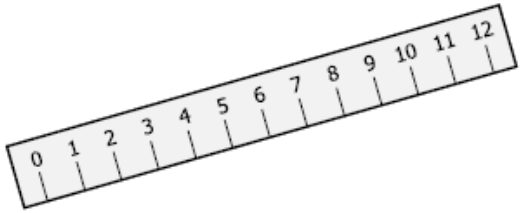

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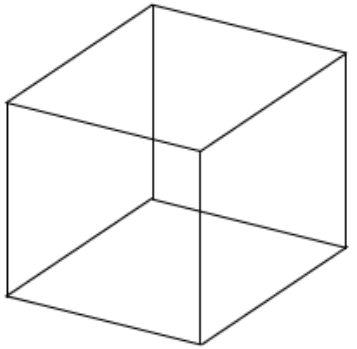

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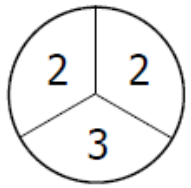

Force 12 = hurricane force

Wind speeds over:

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118 km/h

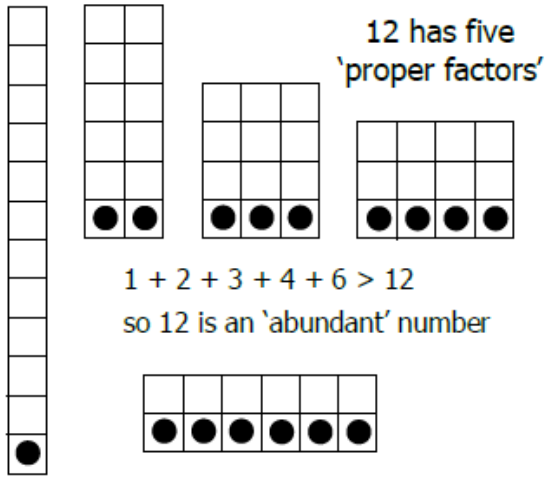
Round 2

Memory Round

Memory Round

Fourth and final viewing of poster coming up!

Twelve facts about the number 12



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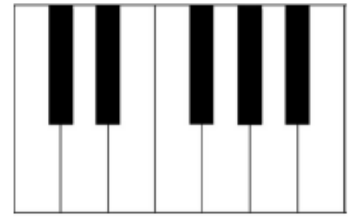

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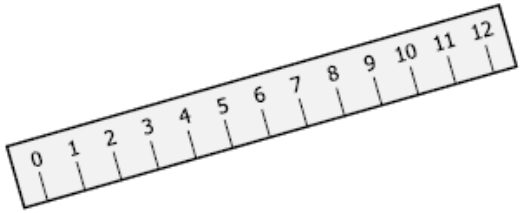

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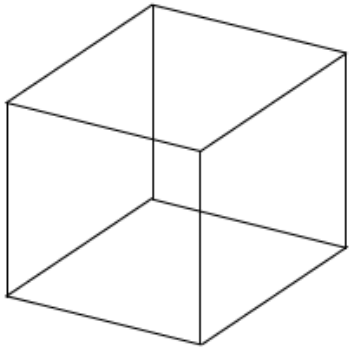

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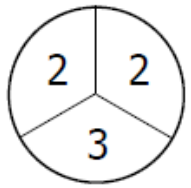


Force 12 = hurricane force

Wind speeds over:

73 mph
118 km/h

Round 2

Memory Round

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

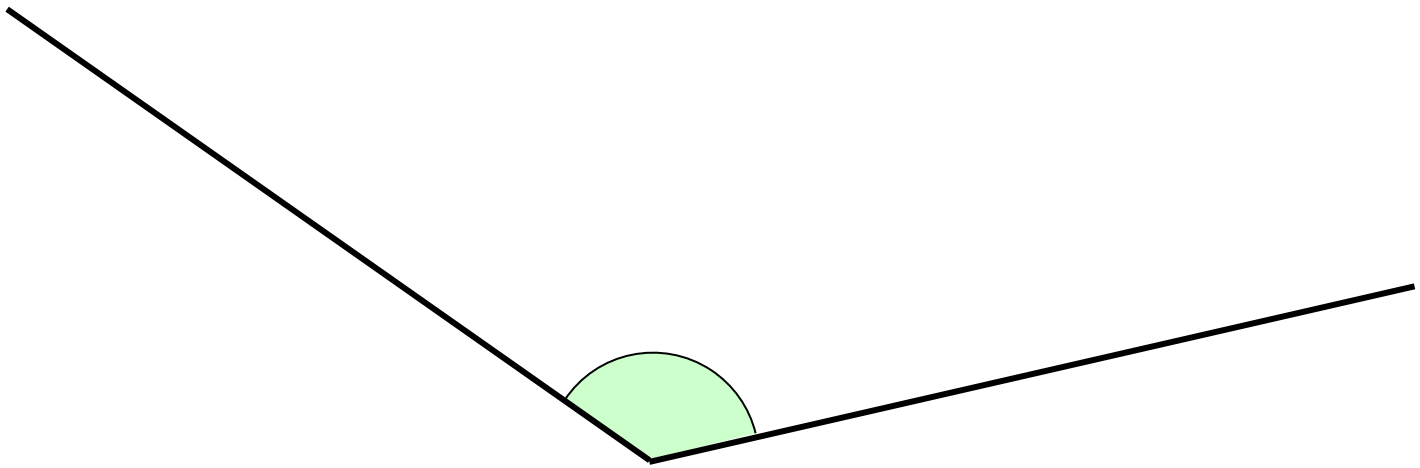
Round 3

Estimation Round

Round 3

Question 1

Estimate the size of the green angle, in degrees.

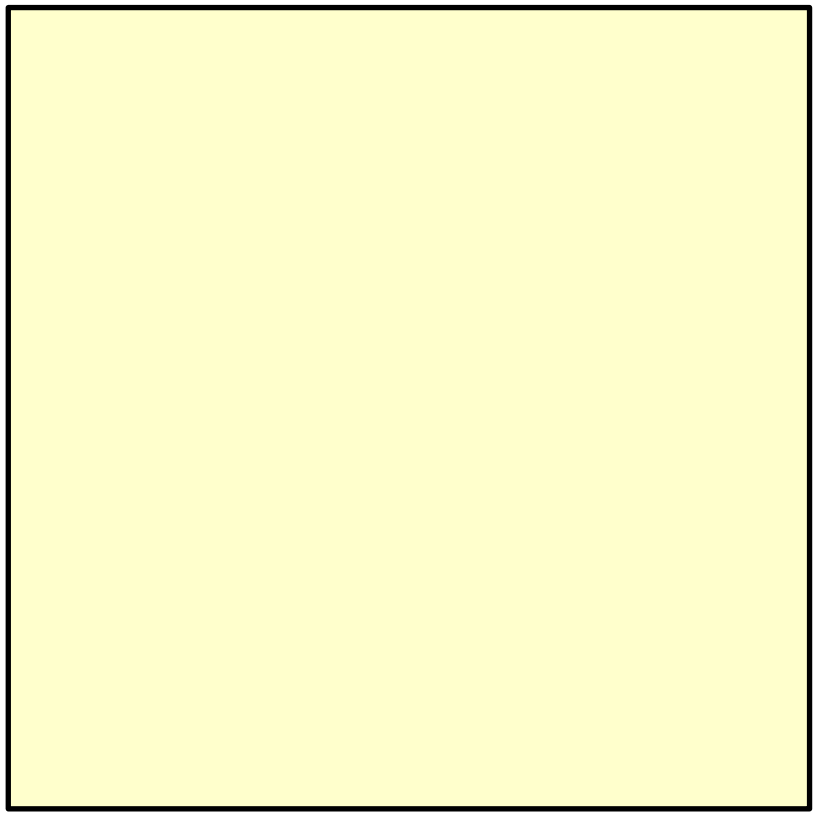


Round 3

Question 2

The area of a square is 1,350 cm².

Estimate the length of the side of the square, to the nearest cm.



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.)

Among other public buildings in a certain town, which for many reasons it will be prudent to refrain from mentioning, and to which I will assign no fictitious name, there is one anciently common to most towns, great or small: to wit, a workhouse; and in this workhouse was born; on a day and date which I need not trouble myself to repeat, inasmuch as it can be of no possible consequence to the reader, in this stage of the business at all events; the item of mortality whose name is prefixed to the head of this chapter.

For a long time after it was ushered into this world of sorrow and trouble, by the parish surgeon, it remained a matter of considerable doubt whether the child would survive to bear any name at all; in which case it is somewhat more than probable that these memoirs would never have appeared; or, if they had, that being comprised within a couple of pages, they would have possessed the inestimable merit of being the most concise and faithful specimen of biography, extant in the literature of any age or country.

Although I am not disposed to maintain that the being born in a workhouse, is in itself the most fortunate and enviable circumstance that can possibly befall a human being, I do mean to say that in this particular instance, it was the best thing for Oliver Twist that could by possibility have occurred. The fact is, that there was considerable difficulty in inducing Oliver to take upon himself the office of respiration: a troublesome practice, but one which custom has rendered necessary to our easy existence; and for some time he lay gasping on a little flock mattress, rather unequally poised between this world and the next: the balance being decidedly in favour of the latter. Now, if, during this brief period, Oliver had been surrounded by careful grandmothers, anxious aunts, experienced nurses, and doctors of profound wisdom, he would most inevitably and indubitably have been killed in no time. There being nobody by, however, but a pauper old woman, who was rendered rather misty by an unwonted allowance of beer; and a parish surgeon who did such matters by contract; Oliver and Nature fought out the point between them. The result was, that, after a few struggles, Oliver breathed, sneezed, and proceeded to advertise to the inmates of the workhouse the fact of a new burden having been imposed upon the parish, by setting up as loud a cry as could reasonably have been expected from a male infant who had not been possessed of that very useful appendage, a voice, for a much longer space of time than three minutes and a quarter.

Round 3

Question 3

Decide on your strategy.

Among other public buildings in a certain town, which for many reasons it will be prudent to refrain from mentioning, and to which I will assign no fictitious name, there is one anciently common to most towns, great or small: to wit, a workhouse; and in this workhouse was born; on a day and date which I need not trouble myself to repeat, inasmuch as it can be of no possible consequence to the reader, in this stage of the business at all events; the item of mortality whose name is prefixed to the head of this chapter.

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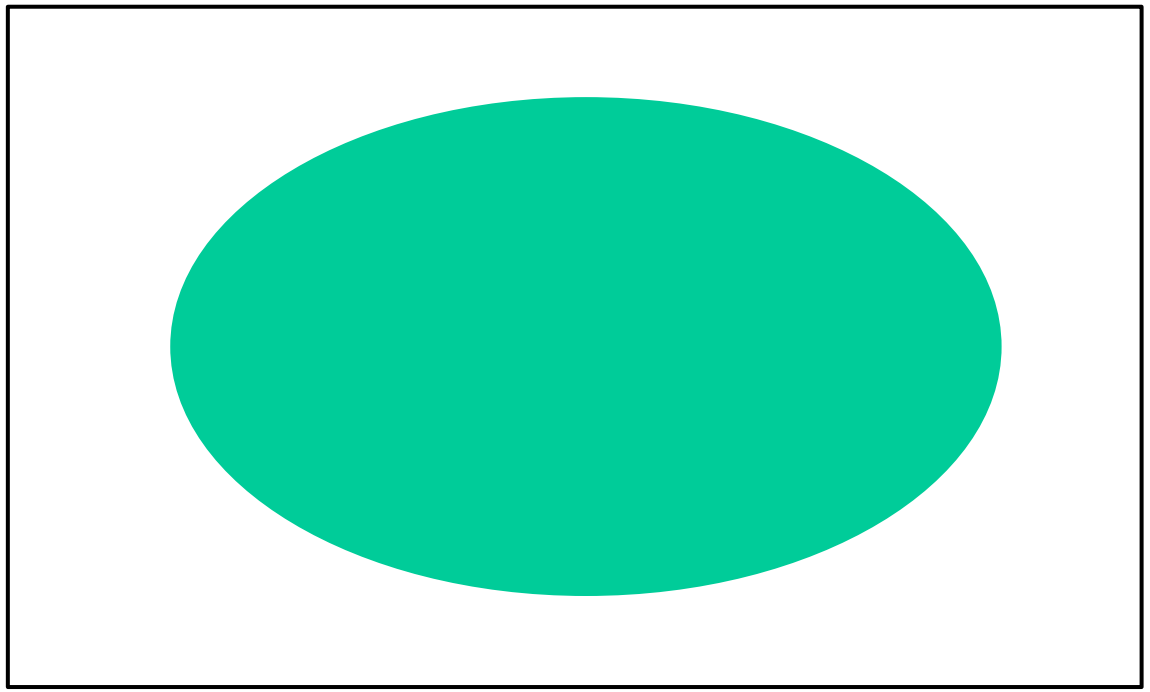
Round 3

Question 4

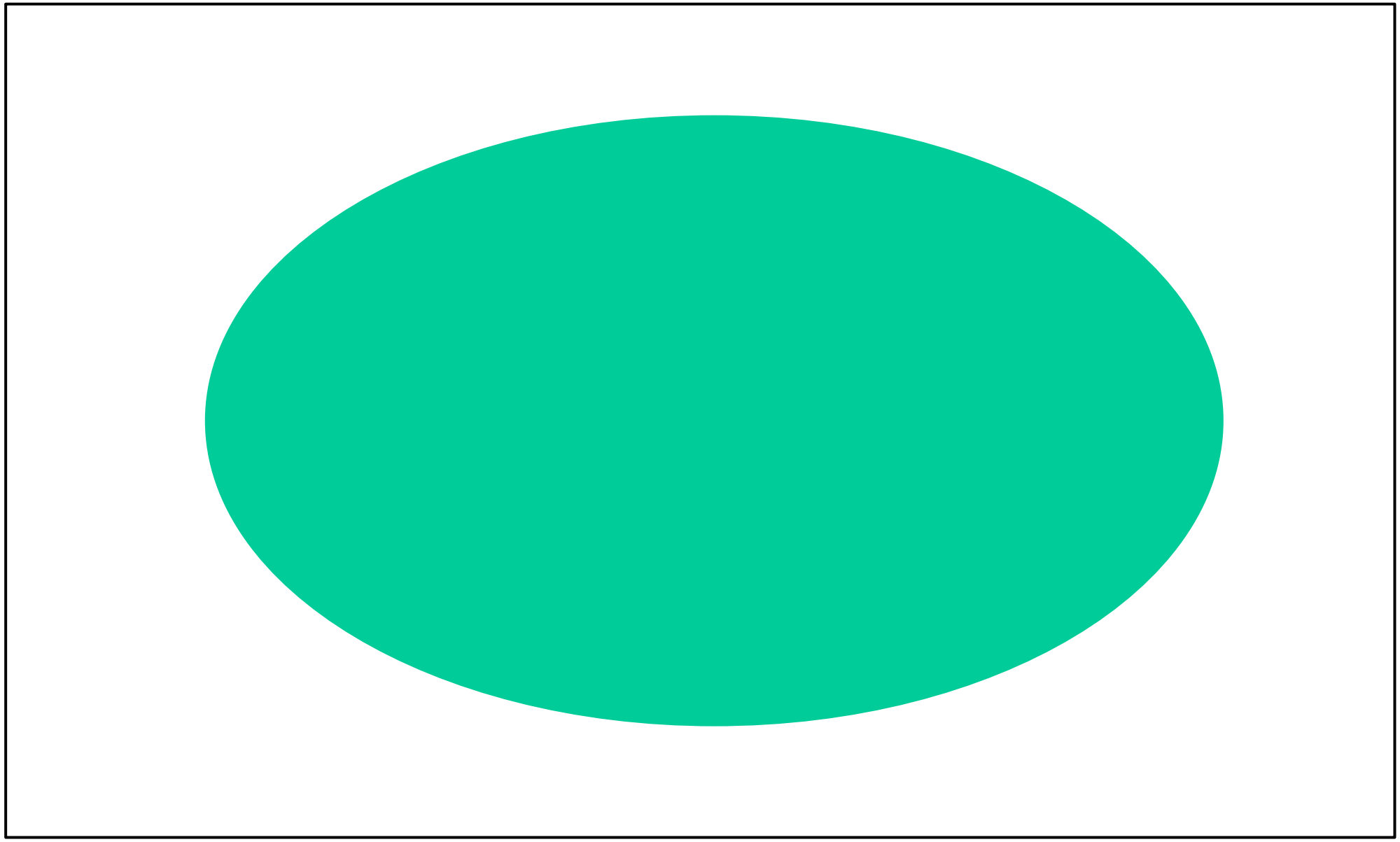


The diagram shows a green ellipse inside a rectangle.

The diagram is drawn to scale.

The dimensions of the rectangle are shown.

Estimate the area of the green ellipse.

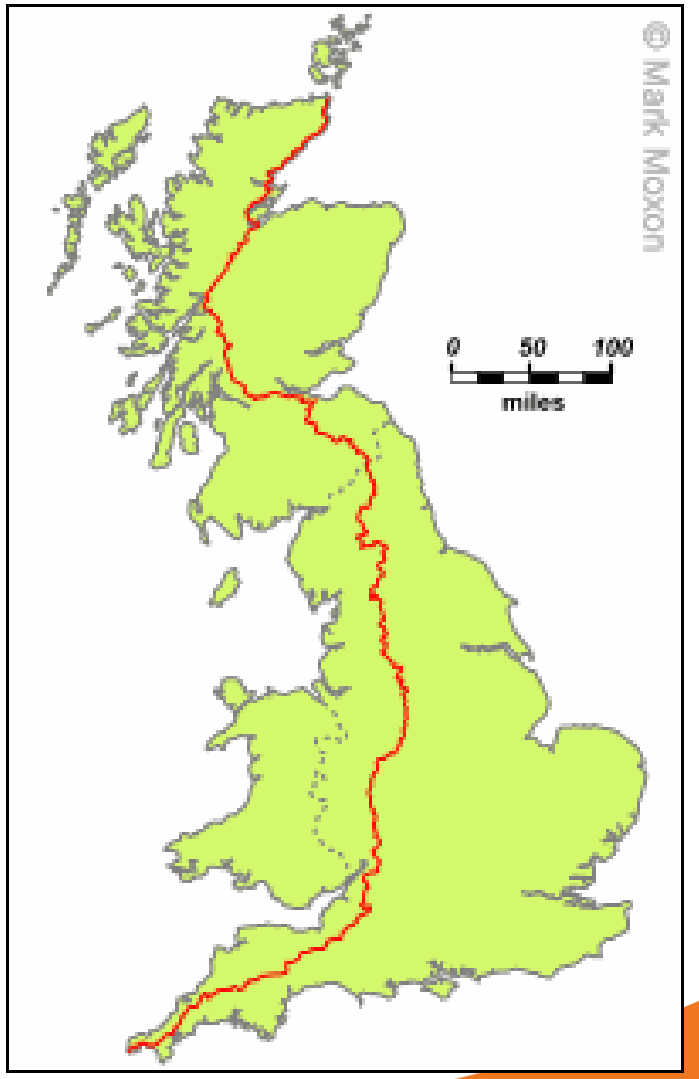

12 cm
20 cm

Round 3

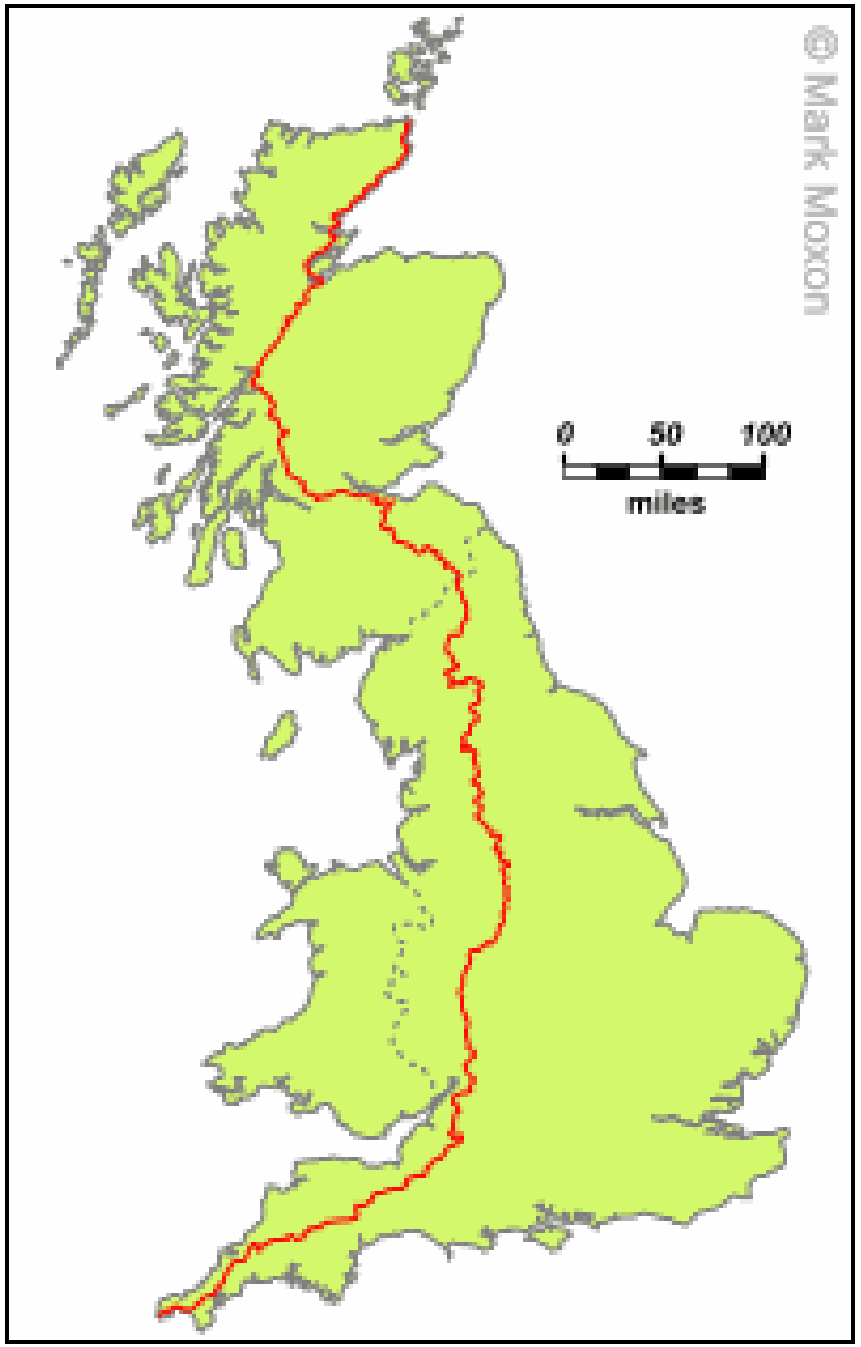
Question 5

Stephen is cycling from Land's End to John O'Groats.

The map shows the route he will take.



Estimate the distance he will cycle, in miles.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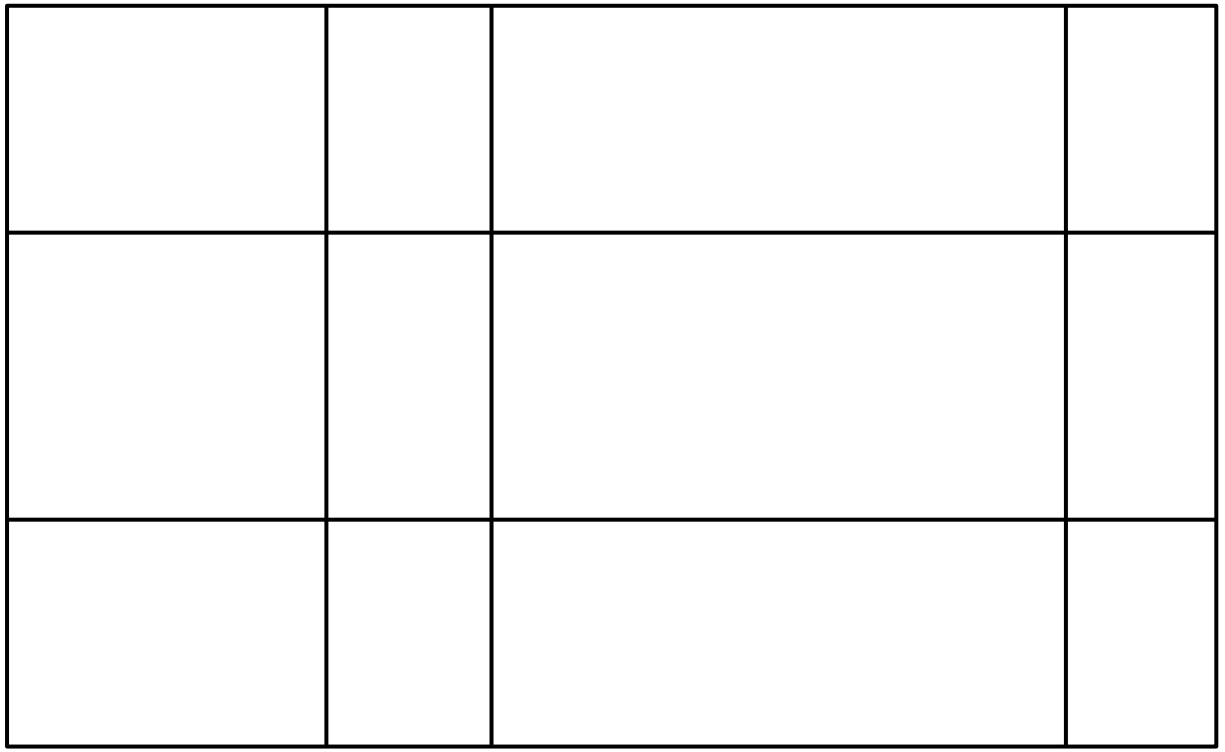
50
100
miles

Round 3

Question 6

How many rectangles are there in this diagram?



(Include squares.)

(If you think the answer is 12, think again!)
(If you think the answer is 13, think again!)

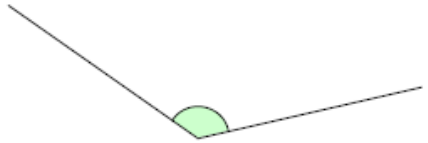
End of Round 3

Round 2

ANSWERS

Round 3 **Question 1**

Estimate the size of the green angle, in degrees.

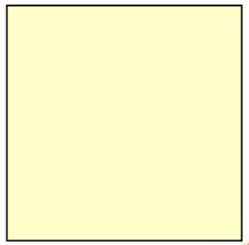


131 to 133°

Round 3 **Question 2**

The area of a square is 1,350 cm².

Estimate the length of the side of the square, to the nearest cm.



36 or 37 cm

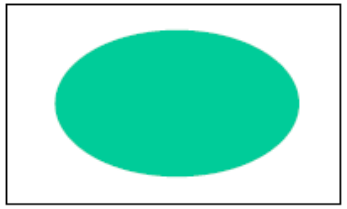
Among other public buildings in a certain town, which for many reasons it will be prudent to refrain from mentioning, and to which I will assign no fictitious name, there is one anciently common to most towns, great or small: to wit, a workhouse; and in this workhouse was born; on a day and date which I need not trouble myself to repeat, inasmuch as it can be of no possible consequence to the reader, in this stage of the business at all events; the item of mortality whose name is prefixed to the head of this chapter.

For a long time after it was ushered into this world of sorrow and trouble, by the parish surgeon, it remained a matter of considerable doubt whether the child would survive to bear any name at all; in which case it is somewhat more than probable that these memoirs would never have appeared; or, if they had, that being comprised within a couple of pages, they would have possessed the inestimable merit of being the most concise and faithful specimen of biography, extant in the literature of any age or country.

Although I am not disposed to maintain that the being born in a workhouse, is in itself the most fortunate and enviable circumstance that can possibly befall a human being, I do mean to say that in this particular instance, it was the best thing for Oliver Twist that could by possibility have occurred. The fact is, that there was considerable difficulty in inducing Oliver to take upon himself the office of respiration: a troublesome practice, but one which custom has rendered necessary to our easy existence; and for some time he lay gasping on a little flock mattress, rather unequally poised between this world and the next: the balance being decidedly in favour of the latter. Now, if, during this brief period, Oliver had been surrounded by careful grandmothers, anxious aunts, experienced nurses, and doctors of profound wisdom, he would most inevitably and indubitably have been killed in no time. There being nobody by, however, but a pauper old woman, who was rendered rather misty by an unwonted allowance of beer; and a parish surgeon who did such matters by contract; Oliver and Nature fought out the point between them. The result was, that, after a few struggles, Oliver breathed, sneezed, and proceeded to advertise to the inmates of the workhouse the fact of a new burden having been imposed upon the parish, by setting up as loud a cry as could reasonably have been expected from a male infant who had not been possessed of that very useful appendage, a voice, for a much longer space of time than three minutes and a quarter.

2,046 to 2,106

Round 3 **Question 4**



The diagram shows a green ellipse inside a rectangle.

The diagram is drawn to scale.

The dimensions of the rectangle are shown.

Estimate the area of the green ellipse.

96 to 106 cm²

Round 3 **Question 5**

Stephen is cycling from Land's End to John O'Groats.

The map shows the route he will take.

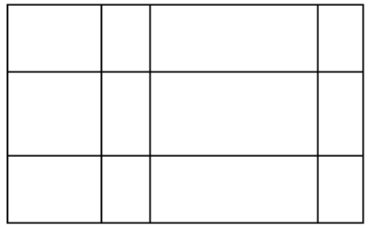
Estimate the distance he will cycle, in miles.

1,061 to 1,161 miles

Round 3 **Question 6**

How many rectangles are there in this diagram?

(Include squares.)



(If you think the answer is 12, think again!)
(If you think the answer is 13, think again!)

60

Round 4

General Mathematics Questions

Round 4

Question 1

Here is a table of old-fashioned measures.

16 drams	= 1 ounce
16 ounces	= 1 pound
7 pounds	= 1 clove
14 pounds	= 1 stone
28 pounds	= 1 tod
112 pounds	= 1 hundredweight
364 pounds	= 1 sack
2240 pounds	= 1 ton
2 stones	= 1 quarter
4 quarters	= 1 hundredweight
20 hundredweight	= 1 ton

How many **stones** are there in a **sack**?

Round 4

Question 2

Here is the description of a number:

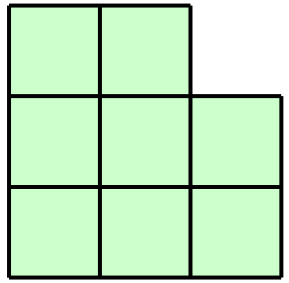
- It is an integer with two digits.
- It is a prime number.
- It is one more than a square number.

There are two possible numbers this could be.
Give both possibilities.

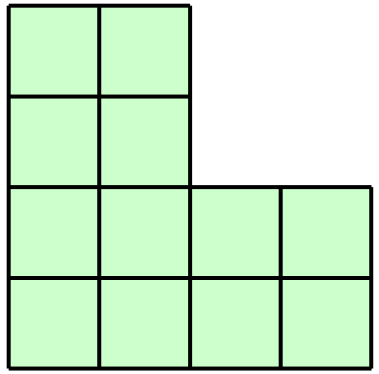
Round 4

Question 3

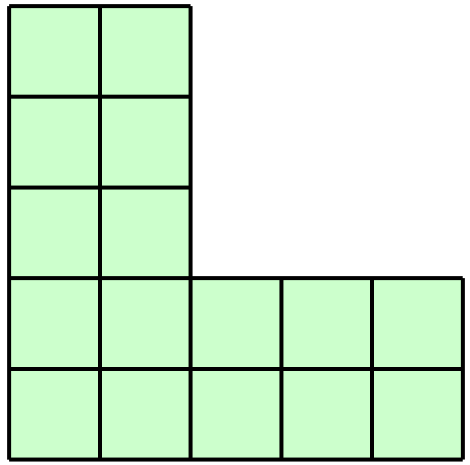
Here is a sequence of patterns made from squares.



Pattern 1
(8 squares)



Pattern 2



Pattern 3

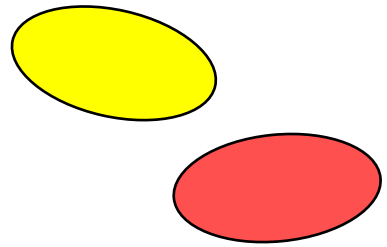
How many squares will there be in **Pattern 6**?

Round 4

Question 4

In a bag, there are 120 sweets.

Some are lemon-flavoured; the rest are strawberry.

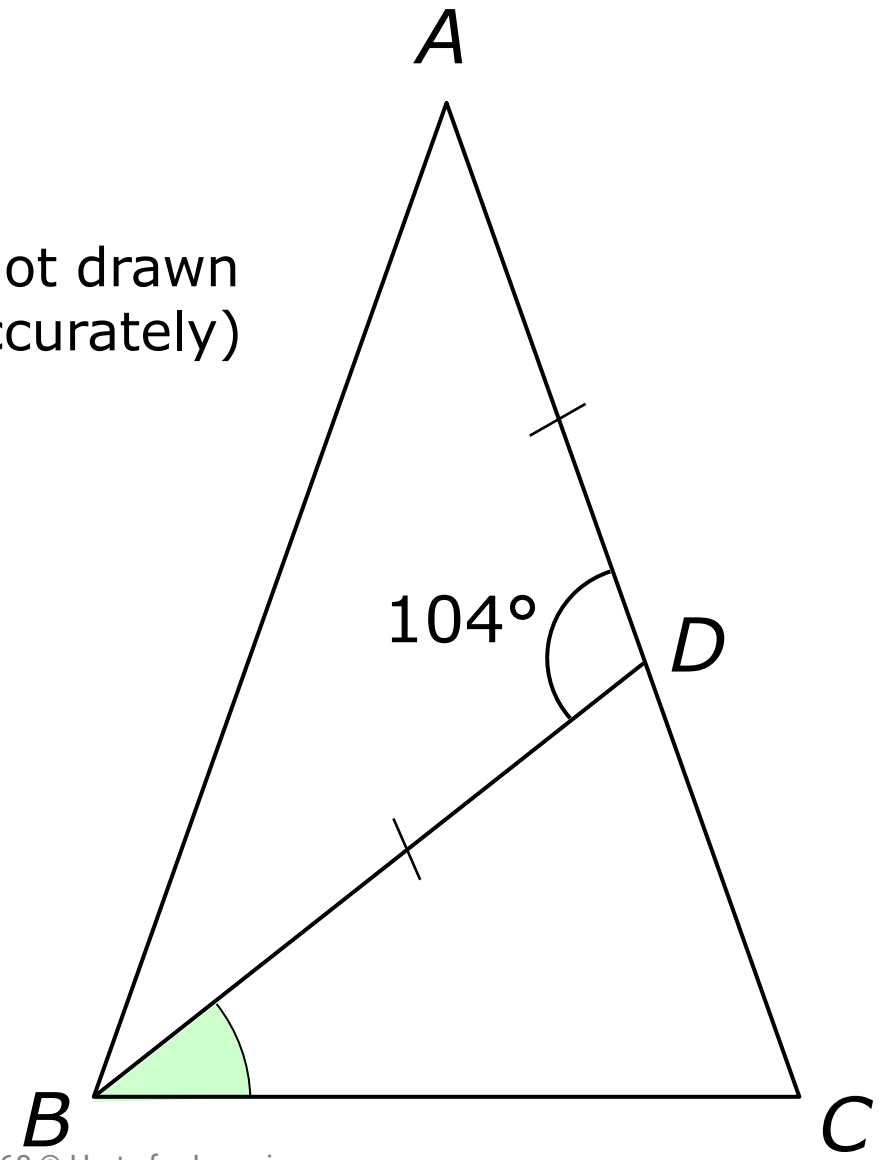


There are **four times** as many lemon sweets as strawberry.

How many strawberry sweets are there in the bag?

Round 4

Question 5



(not drawn accurately)

In the diagram, triangles *ABC* and *DAB* are both isosceles.

$AB = AC$

$DB = DA$

Angle $ADB = 104°$

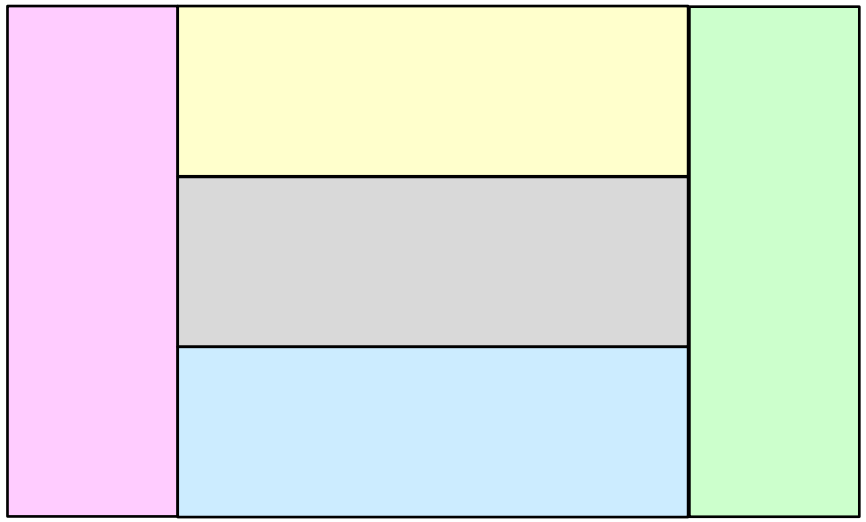
Work out the size of angle *DBC* (marked in green).

Round 4

Question 6

Five identical rectangles are arranged to make a larger rectangle.

The total area of the larger rectangle is 240 cm².



What is the perimeter of the larger rectangle?

End of Round 4

Year 7 Mathematics Challenge 2022
Heat 1

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**

Here is a table of old-fashioned measures.

16 drams	= 1 ounce
16 ounces	= 1 pound
7 pounds	= 1 clove
14 pounds	= 1 stone
28 pounds	= 1 tod
112 pounds	= 1 hundredweight
364 pounds	= 1 sack
2240 pounds	= 1 ton
2 stones	= 1 quarter
4 quarters	= 1 hundredweight
20 hundredweight	= 1 ton

How many **stones** are there in a **sack**?

26

Round 4 **Question 2**

Here is the description of a number:

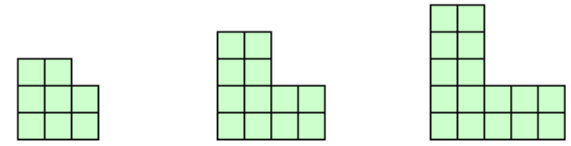
- It is an integer with two digits.
- It is a prime number.
- It is one more than a square number.

There are two possible numbers this could be. Give both possibilities.

17 and 37

Round 4 **Question 3**

Here is a sequence of patterns made from squares.



How many squares will there be in **Pattern 6**?

28

Round 4 **Question 4**

In a bag, there are 120 sweets.

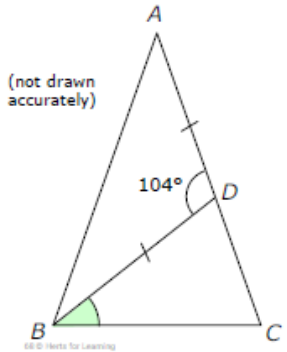
Some are lemon-flavoured; the rest are strawberry.

There are **four times** as many lemon sweets as strawberry.

How many strawberry sweets are there in the bag?

24

Round 4 **Question 5**



In the diagram, triangles *ABC* and *DAB* are both isosceles.

AB = *AC*

DB = *DA*

Angle *ADB* = 104°

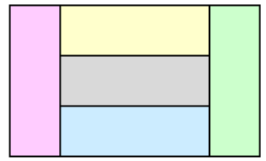
Work out the size of angle *DBC* (marked in green).

33°

Round 4 **Question 6**

Five identical rectangles are arranged to make a larger rectangle.

The total area of the larger rectangle is 240 cm².



What is the perimeter of the larger rectangle?

64 cm

Well done to all

Year 7 Mathematics Challenge 2022

Heat 1, Thursday 3rd March 2022

via *Livestorm*

William Thallon

Teaching and Learning Adviser (Secondary Maths)

David Cook

Lead Teaching and Learning Adviser (Primary Maths)