### Year 8 Mathematics Challenge 2021 Final, Wednesday 16th June 2021 via Livestorm



#### William Thallon

Teaching and Learning Adviser (Secondary Maths) David Cook

Lead Teaching and Learning Adviser (Primary Maths)



#### A warm welcome to ...

Chauncy Dame Alice Owen's Fearnhill Hockerill Marriotts Team A Marriotts Team B Presdales Queens' Richard Hale Team A Richard Hale Team B

**Ridgeway Academy** Roundwood Park St George's Highfield Thomas Alleyne Academy Townsend Verulam Watford Boys' Watford Girls' Team A Watford Girls' Team B

#### **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.



## General Mathematics Questions







#### This 6-digit number is a multiple of 9.



The missing digits are the same.

## What digit goes in the two empty boxes?





The numbers in each triangle follow the same rule.



Work out the missing number (in the yellow cell).





#### What is the smallest number which is

• 7 more than a multiple of 100

and

• 5 less than a multiple of 102?





#### The blue triangle is drawn on a centimetre square grid.



#### Work out the area of the triangle, in cm<sup>2</sup>

To make a number from this grid:

- Start on any digit.
- To get the next digit, move one square horizontally or vertically (**not** diagonally).
- You may not visit the same square more than once.





In the example, the number that has been made is **38915726**.

To make a number from this grid:

- Start on any digit.
- To get the next digit, move one square horizontally or vertically (**not** diagonally).
- You may not visit the same square more than once.





Using these rules, what is the largest number that can be made?

**Question 6** 

The diagram shows two overlapping **congruent** rectangles.

The blue area is **40%** of the area of each rectangle.



What percentage of the whole diagram is shaded?

## End of Round 1

#### **ANSWERS**



## Memory Round



#### **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.

#### Some facts about ...

#### 3·14159 26535 89793 23846 26433 83279...



(commonly known as  $\pi$ )

- The number  $\pi$  is the ratio of the circumference to the diameter of a circle.
- $\pi$  is mentioned in the Bible as being a little over 3.
- In 1873, William Shanks worked out the value of  $\pi$  to 527 decimal places.
- In 2020, a computer took 303 days to calculate the value to more than 50 trillion digits.
- Here is a rhyme to memorise the digits of  $\pi$ :

How I wish I could recollect pi Eureka, cried the great inventor Christmas pudding, Christmas pie, Is the problem's very centre.

•  $\pi$  is an irrational number. This means it can't be expressed exactly as a fraction.

• 
$$\frac{22}{7} = 3.14 (2 \text{ d.p.}); \frac{355}{113} = 3.141593 (6 \text{ d.p.}).$$

$$\pi = \frac{4}{1} - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \dots$$
  
$$\pi = 3 + \frac{4}{3^3 - 3} - \frac{4}{5^3 - 5} + \frac{4}{7^3 - 7} - \dots$$

## Memory Round



#### **Memory Round**

## Second viewing of poster coming up!

#### Some facts about ...

#### 3·14159 26535 89793 23846 26433 83279...



(commonly known as  $\pi$ )

- The number  $\pi$  is the ratio of the circumference to the diameter of a circle.
- $\pi$  is mentioned in the Bible as being a little over 3.
- In 1873, William Shanks worked out the value of  $\pi$  to 527 decimal places.
- In 2020, a computer took 303 days to calculate the value to more than 50 trillion digits.
- Here is a rhyme to memorise the digits of  $\pi$ :

How I wish I could recollect pi Eureka, cried the great inventor Christmas pudding, Christmas pie, Is the problem's very centre.

•  $\pi$  is an irrational number. This means it can't be expressed exactly as a fraction.

• 
$$\frac{22}{7} = 3.14 (2 \text{ d.p.}); \frac{355}{113} = 3.141593 (6 \text{ d.p.}).$$

$$\pi = \frac{4}{1} - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \dots$$
  
$$\pi = 3 + \frac{4}{3^3 - 3} - \frac{4}{5^3 - 5} + \frac{4}{7^3 - 7} - \dots$$

## Memory Round



#### **Memory Round**

## Third viewing of poster coming up!

#### Some facts about ...

#### 3·14159 26535 89793 23846 26433 83279...



(commonly known as  $\pi$ )

- The number  $\pi$  is the ratio of the circumference to the diameter of a circle.
- $\pi$  is mentioned in the Bible as being a little over 3.
- In 1873, William Shanks worked out the value of  $\pi$  to 527 decimal places.
- In 2020, a computer took 303 days to calculate the value to more than 50 trillion digits.
- Here is a rhyme to memorise the digits of  $\pi$ :

How I wish I could recollect pi Eureka, cried the great inventor Christmas pudding, Christmas pie, Is the problem's very centre.

•  $\pi$  is an irrational number. This means it can't be expressed exactly as a fraction.

• 
$$\frac{22}{7} = 3.14 (2 \text{ d.p.}); \frac{355}{113} = 3.141593 (6 \text{ d.p.}).$$

$$\pi = \frac{4}{1} - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \dots$$
  
$$\pi = 3 + \frac{4}{3^3 - 3} - \frac{4}{5^3 - 5} + \frac{4}{7^3 - 7} - \dots$$

## Memory Round



#### **Memory Round**

### Fourth and final viewing of poster coming up!

#### Some facts about ...

#### 3·14159 26535 89793 23846 26433 83279...



(commonly known as  $\pi$ )

- The number  $\pi$  is the ratio of the circumference to the diameter of a circle.
- $\pi$  is mentioned in the Bible as being a little over 3.
- In 1873, William Shanks worked out the value of  $\pi$  to 527 decimal places.
- In 2020, a computer took 303 days to calculate the value to more than 50 trillion digits.
- Here is a rhyme to memorise the digits of  $\pi$ :

How I wish I could recollect pi Eureka, cried the great inventor Christmas pudding, Christmas pie, Is the problem's very centre.

•  $\pi$  is an irrational number. This means it can't be expressed exactly as a fraction.

• 
$$\frac{22}{7} = 3.14 (2 \text{ d.p.}); \frac{355}{113} = 3.141593 (6 \text{ d.p.}).$$

$$\pi = \frac{4}{1} - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \dots$$
  
$$\pi = 3 + \frac{4}{3^3 - 3} - \frac{4}{5^3 - 5} + \frac{4}{7^3 - 7} - \dots$$

## 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

## Estimation and Problem-Solving Round









What number is the arrow pointing to?





The diagram shows a cube of concrete and a cube of gold, drawn to the same scale.

Gold

How many times heavier is the concrete cube than the gold cube?

The mass of 1 cm<sup>3</sup> of concrete is 2.4 grams.

The mass of 1 cm<sup>3</sup> of gold is 19.3 grams.

#### **Question 3**

This photograph was taken during last week's partial eclipse of the Sun.

Estimate the percentage of the Sun's disc which is hidden by the Moon.







#### 2021 is the product of **two** prime numbers.

#### What are they?





This is a 'magic multiplication square'.

The product of each row, column and diagonal is the same.

(In this example, the 'magic number' is **216**.)

Here is a magic multiplication square with a different 'magic number'.

What number goes in the shaded square?



**Question 5** 

#### **Question 6**



Here are two different isosceles triangles that can be drawn on a 5 by 5 dotty grid

This isosceles triangle (**C**) does **not** count as different, as it is congruent to triangle **A**.



In total, **how many different** isosceles triangles is it possible to draw on a 5 by 5 dotty grid?









1	4
	2
	5











1	4
	2
	5











1	4	
	2	
	0	



## End of Round 3

Round 3

#### **ANSWERS**



#### 0.66 to 0.68

2021 is the product of two prime numbers.

What are they?

**Ouestion 4** 



11.4 to 12.4



#### Round 3

This photograph was taken during last week's partial eclipse of the Sun.

Estimate the percentage of the Sun's disc which is hidden by the Moon.

**Question 3** 

#### 27.1 to 29.1%



43 and 47

## General Mathematics Questions





#### **Question 1**

Two ordinary, unbiased dice are rolled.



The numbers on the dice are **multiplied** together.

What is the probability that the result is a multiple of 6? (Give the answer as a fraction.)



ABCD is a parallelogram.

The point *E* lies on the side *AB*.

The diagram is **not** drawn accurately.



#### Work out the size of angle DEC.



#### **Question 3**

### The positive numbers *a*, *b*, *c* and *d* each satisfy an equation:

 $a^2 - 1 = 19$  6b - 2 = 4b + 7 $\frac{21}{c} = 5$  5(d - 1) = 17

Write a, b, c and d in ascending order (starting with the smallest)

#### **Question 4**

In the sketch diagram, which is not drawn to scale,

A is the point (-6, 2)B is the point (14, 17)



The point *C* lies on the line *AB*, between *A* and *B*. The ratio of distances *AC*:*CB* is 2:3.

What are the co-ordinates of the point C?



#### Example

### Here is a painting by the artist Vincent Van Gogh.



The pie chart shows the relative proportions of the **five** colours **most used** in the painting.



(This idea came from the artist Arthur Buxton.)





#### Match the correct pie chart to each of these paintings.

Reaper



#### Starry Night







**Question 6** 

The diagram shows four white squares and five green rectangles.

It is not drawn accurately.

Work out the total area shaded green, in cm<sup>2</sup>

## End of Round 4

#### Year 8 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

#### **ANSWERS**



#### Year 8 Mathematics Challenge Final 2021

# Marking in progress

#### Year 8 Mathematics Challenge Final 2021

# Results imminent!

#### Well done to all



### Year 8 Mathematics Challenge 2021 Final, Wednesday 16th June 2021 via Livestorm



#### William Thallon

Teaching and Learning Adviser (Secondary Maths) David Cook

Lead Teaching and Learning Adviser (Primary Maths)

