

United Kingdom  
Mathematics Trust

TEAM MATHS  
CHALLENGE  
2019

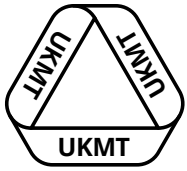
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RELAY

**A1**

What is the value of  $201 + 9 + 201 \times 9$ ?

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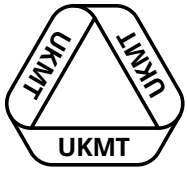
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A2

What is the difference between the largest and smallest four-digit integers that can be made using all four digits of 2019?

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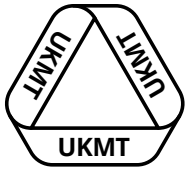
A3

Two numbers,  $a$  and  $b$ , are in the ratio  $1 : 2$ .

When 8 is added to both numbers, the ratio becomes  $3 : 4$ .

What is the sum of  $a$  and  $b$ ?

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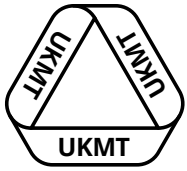
RELAY

A4

A cheque book contains cheques with serial numbers running from 921684 to 921718 consecutively. For reasons of security, all cheques with serial numbers divisible by 5 are then removed.

How many cheques are left?

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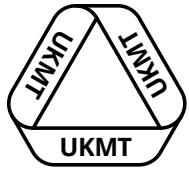
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**A5**

An isosceles triangle has vertices at  $(7, 8)$ ,  $(a, 3)$  and  $(7, 3)$ .  
What is the product of all the possible values that  $a$  could have?

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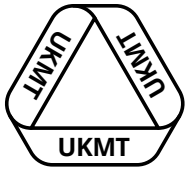
RELAY

# A6

Two different digits are chosen from the four digits of 2019 and the mean is calculated. This is repeated with all possible pairs of different digits.

What is the mean of their means?

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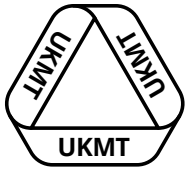
A7

A sequence of cubes has edge lengths which follow the Fibonacci sequence: 1 cm, 1 cm, 2 cm, 3 cm, and so on.

What is the total surface area of the first six cubes?

ANSWER:

cm<sup>2</sup>



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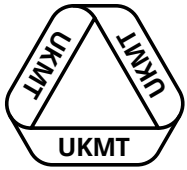
A8

The positive integers  $a$ ,  $b$  and  $c$  are not necessarily distinct.  
The sum of  $a$ ,  $b$  and  $c$  is 10.

How many possible values are there for the product of the integers  $a$ ,  $b$  and  $c$ ?

ANSWER:





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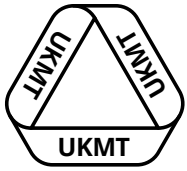
RELAY

A9

You are given that  $20\,192\,019 \div 99 = 203\,959\frac{78}{99}$ .

What is the remainder when  $20\,192\,019$  is divided by  $33$ ?

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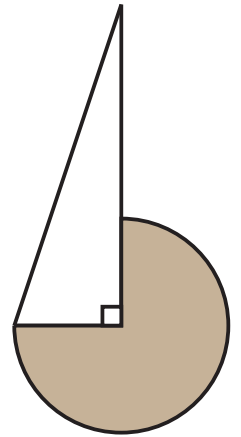
# A10

The diagram shows a right-angled triangle and a sector of a circle, whose centre lies at one of the vertices of the triangle.

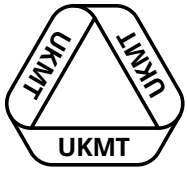
The longest sides of the triangle measure 20 cm and 19 cm. The length of the shortest side is equal to the radius of the circle.

The shaded area can be written  $\frac{a\pi}{4} \text{ cm}^2$ .

What is the value of  $a$ ?



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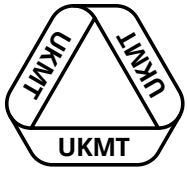
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# A11

Adding  $n$  to 2019 produces a positive integer that is divisible by every integer from 1 to 10 inclusive.

What is the smallest possible value of  $n$ ?

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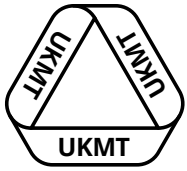
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# A12

Three identical dice each have their faces marked with the first six squares. One, two or all three dice may be rolled and their values added together to obtain a total score. There are four primes under fifty that cannot be obtained as a total score.

What is the sum of these four primes?

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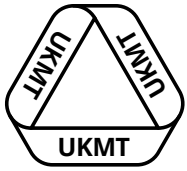
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# B1

What is the difference between 19% of 20 and 20% of 19?

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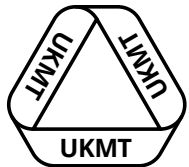
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**B2**

What is the units digit of  $20^{20} + 19^{19}$ ?

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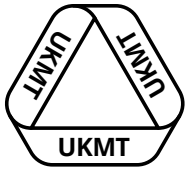
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# B3

Six cards are in the shape of the first six regular polygons. On each card is written the exterior angle corresponding to the card shape. Any cards showing non-integers are discarded. The mean of the numbers on the remaining cards is  $7n + 0.4$ , where  $n$  is an integer.

What is the value of  $n$ ?

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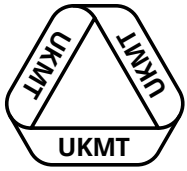
# B4

Two different digits are chosen from the four digits of 2019, to make a two-digit number.

What is the range of all the possible numbers made in this way?

ANSWER:





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# B5

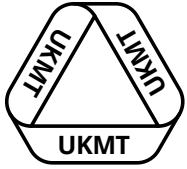
A quadrilateral  $ABCD$  has four different interior angles.

Angle  $A = 88^\circ$ , and angle  $B = 140^\circ$ .

Angle  $C$  is half of one of the angles already mentioned.

What is angle  $D$ ?

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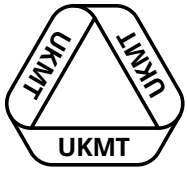
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# B6

What is the sum of the four factors of 2019?

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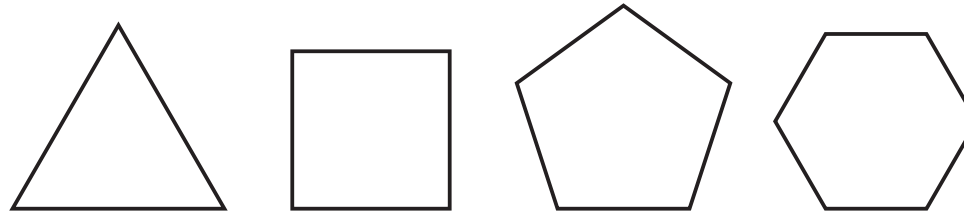
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# B7

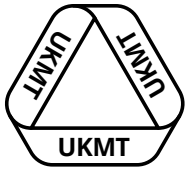
The four regular polygons shown here have integer edge lengths in cm. Their perimeters are equal.



What is the shortest possible length for the side of the pentagon?

ANSWER:

cm



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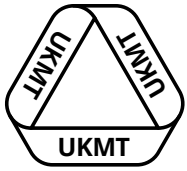
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# B8

Squash balls have either one yellow dot or two yellow dots.  
A large box contains 2019 squash balls with 3519 yellow dots  
altogether.

How many balls in the box have two yellow dots?

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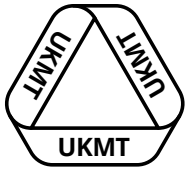
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# B9

Twenty consecutive multiples of 4 have a mean of 58.

What is the product of the smallest and the largest of these twenty numbers?

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# B10

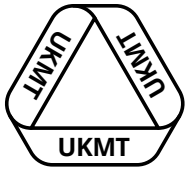
In the following calculation,  $a$ ,  $b$  and  $c$  represent non-zero digits, not necessarily distinct. Each  $*$  could represent any non-zero digit, again not necessarily distinct.

$$a^8 = * * *$$

$$\begin{array}{r} 3^b = * * c \quad + \\ \hline c * * \\ \hline \end{array}$$

What is the value of  $a + b + c$ ?

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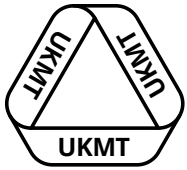
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# B11

What is the median of all the four-digit even numbers that can be formed by rearranging the digits of 2019?

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# B12

I am in a country where there are just five coins:

1 centime, 2 centimes, 5 centimes,  
6 centimes and 9 centimes.

I have one of each of these five coins in my pocket.

I am in a shop where there are articles for sale with every price from 1 centime up to 23 centimes.

What is the product of all the prices in this shop, for which I cannot pay exactly?

ANSWER: