

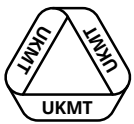
United Kingdom  
Mathematics Trust

TEAM MATHS  
CHALLENGE  
2019

REGIONAL FINAL

SHUTTLE

© UKMT 2019



United Kingdom  
Mathematics Trust

TEAM MATHS  
CHALLENGE  
2019

REGIONAL FINAL

SHUTTLE

© UKMT 2019

# A1

Pass on the value of  $24 - 16 \div 2^3$ .

# A3

*T* is the number you will receive.

Nala, Lana and Alan share  $27T$  sweets in the ratio  
 $4 : 3 : 2$ .

Nala receives  $K$  sweets.

Pass on the value of  $K$ .



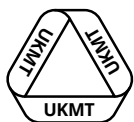
United Kingdom  
Mathematics Trust

TEAM MATHS  
CHALLENGE  
2019

REGIONAL FINAL

SHUTTLE

© UKMT 2019



United Kingdom  
Mathematics Trust

TEAM MATHS  
CHALLENGE  
2019

REGIONAL FINAL

SHUTTLE

© UKMT 2019

**A2**

*T* is the number you will receive.

$\frac{T}{15} - \frac{7}{20} = \frac{a}{b}$ , a fraction in its lowest terms.

Pass on the value of  $a - b$ .

**A4**

*T* is the number you will receive.

The first three terms in a sequence are

2019,  $2019 - T$ ,  $2019 - 2T$ .

Each term is  $T$  less than the previous term.

Write down the value of the 25th term.



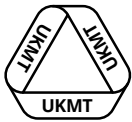
United Kingdom  
Mathematics Trust

TEAM MATHS  
CHALLENGE  
2019

REGIONAL FINAL

SHUTTLE

© UKMT 2019



United Kingdom  
Mathematics Trust

TEAM MATHS  
CHALLENGE  
2019

REGIONAL FINAL

SHUTTLE

© UKMT 2019

# B1

Pass on the value of

$$\frac{10 \times 9 \times 8}{6 \times 5 \times 4 \div (3 \times 2 \times 1)}$$

# B3

*T* is the number you will receive.

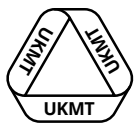
Ajesh and Beejesh race each other along a straight track.

Ajesh runs *T* metres in 10 seconds.

Beejesh runs *T* metres in 8 seconds.

They start together, and after *K* seconds, they are 60 metres apart.

Pass on the value of *K*.



United Kingdom  
Mathematics Trust

TEAM MATHS  
CHALLENGE  
2019

REGIONAL FINAL

SHUTTLE

© UKMT 2019



United Kingdom  
Mathematics Trust

TEAM MATHS  
CHALLENGE  
2019

REGIONAL FINAL

SHUTTLE

© UKMT 2019

**B2**

*T* is the number you will receive.

$$\frac{201}{9} - 20\frac{1}{9} = \frac{K}{T}$$

Pass on the value of *K*.

**B4**

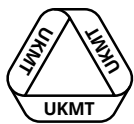
*T* is the number you will receive.

A sequence starts

2019, 2018, 1, ... .

In this sequence, each successive term is the positive difference between the previous two terms.

Write down the value of the  $(T + 1)$ th term.



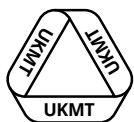
United Kingdom  
Mathematics Trust

TEAM MATHS  
CHALLENGE  
2019

REGIONAL FINAL

SHUTTLE

© UKMT 2019



United Kingdom  
Mathematics Trust

TEAM MATHS  
CHALLENGE  
2019

REGIONAL FINAL

SHUTTLE

© UKMT 2019

# C1

$$144 = 2^a \times 3^b \quad \text{and} \quad 324 = 2^c \times 3^d.$$

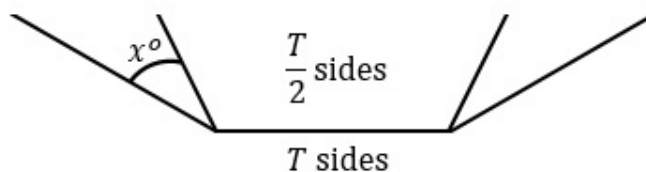
Pass on the value of  $a + b + c + d - 2$ .

# C3

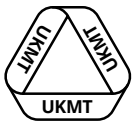
*T is the number you will receive.*

Two regular polygons, one inside the other, share a common side. The inside polygon has  $\frac{T}{2}$  sides. The outside polygon has  $T$  sides.

This is indicated in the diagram below.



Pass on the value of  $x$ .



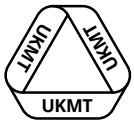
United Kingdom  
Mathematics Trust

TEAM MATHS  
CHALLENGE  
2019

REGIONAL FINAL

SHUTTLE

© UKMT 2019



United Kingdom  
Mathematics Trust

TEAM MATHS  
CHALLENGE  
2019

REGIONAL FINAL

SHUTTLE

© UKMT 2019

**C2**

*T* is the number you will receive.

Let

$$X = T \left( \frac{1}{2} + \frac{2}{3} \times \frac{3}{4} \div \frac{5}{6} \right).$$

Pass on the value of  $X + 1$ .

**C4**

*T* is the number you will receive.

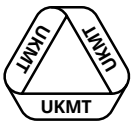
Abdul says to Paula:

"If you give me  $T$  pencils, I will have twice as many pencils as you."

Paula says to Abdul:

"If you give me  $T$  pencils, I will have three times as many pencils as you."

Write down the total number of pencils that Abdul and Paula have.



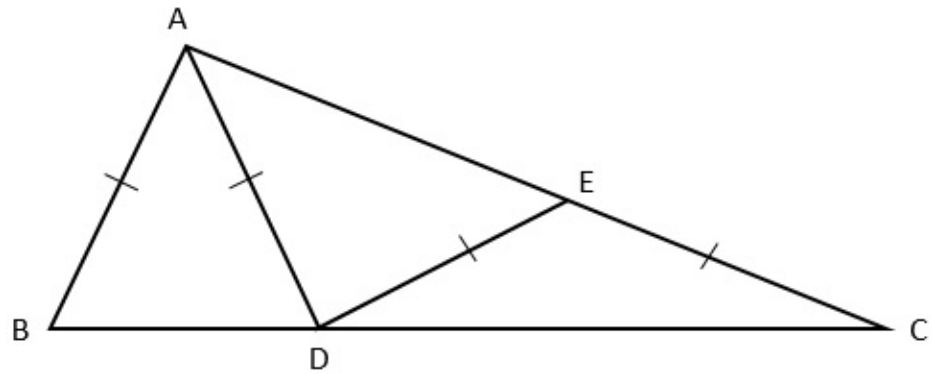
United Kingdom  
Mathematics Trust

TEAM MATHS  
CHALLENGE  
2019

REGIONAL FINAL

SHUTTLE

# D1

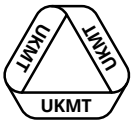


In triangle  $ABC$ ,  $D$  is a point on  $BC$  such that  $AB = AD$  and  $E$  is a point on  $AC$  such that  $EC = ED = AD$ .

Angle  $ABC$  is  $60^\circ$ . Angle  $CAB$  is  $K^\circ$ .

Pass on the value of  $K$ .

© UKMT 2019



United Kingdom  
Mathematics Trust

TEAM MATHS  
CHALLENGE  
2019

REGIONAL FINAL

SHUTTLE

# D3

$T$  is the number you will receive.

Point  $A$  with coordinates  $(3, 2)$  is reflected in the line  $y = 4$  to obtain point  $B$ .

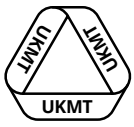
Point  $B$  is then reflected in the line  $y = x$  to obtain point  $C$ .

Finally, point  $C$  is reflected in the line  $x = T$  to obtain point  $D$ .

The coordinates of point  $D$  are  $(a, b)$ .

Pass on the value of  $a - 2b$ .

© UKMT 2019



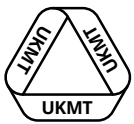
United Kingdom  
Mathematics Trust

TEAM MATHS  
CHALLENGE  
2019

REGIONAL FINAL

SHUTTLE

© UKMT 2019



United Kingdom  
Mathematics Trust

TEAM MATHS  
CHALLENGE  
2019

REGIONAL FINAL

SHUTTLE

© UKMT 2019

**D2**

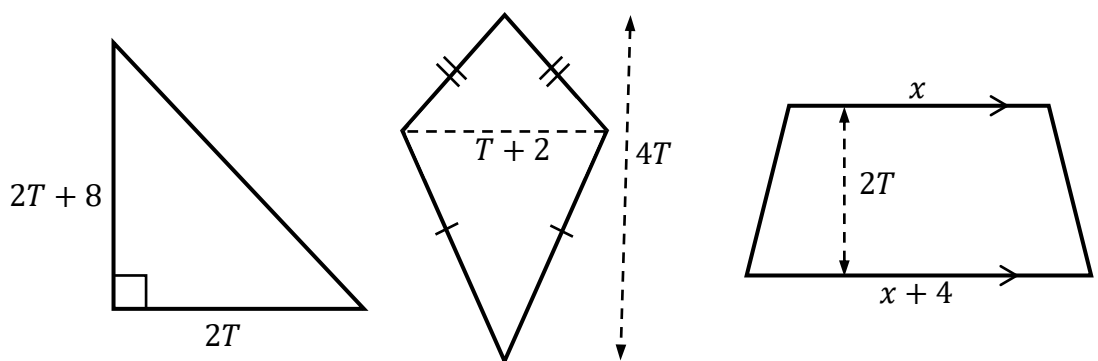
*T is the number you will receive.*

$$\text{Let } \sqrt{T}(x - 3) - 2(x - \sqrt{T}) = 4\sqrt{T} - (10 - 3x).$$

Pass on the value of  $x$ .

**D4**

*T is the number you will receive.*



The sum of the area of the triangle and the area of the kite is equal to the area of the trapezium.

Write down the value of  $x$ .



TEAM NUMBER

SCHOOL NAME

<p><b>A1</b></p> <p style="text-align: right;">0 1 3</p>	<p><b>B1</b></p> <p style="text-align: right;">0 1 3</p>	<p><b>C1</b></p> <p style="text-align: right;">0 1 3</p>	<p><b>D1</b></p> <p style="text-align: right;">0 1 3</p>
<p><b>A2</b></p> <p style="text-align: right;">0 1 3</p>	<p><b>B2</b></p> <p style="text-align: right;">0 1 3</p>	<p><b>C2</b></p> <p style="text-align: right;">0 1 3</p>	<p><b>D2</b></p> <p style="text-align: right;">0 1 3</p>
<p><b>A3</b></p> <p style="text-align: right;">0 1 3</p>	<p><b>B3</b></p> <p style="text-align: right;">0 1 3</p>	<p><b>C3</b></p> <p style="text-align: right;">0 1 3</p>	<p><b>D3</b></p> <p style="text-align: right;">0 1 3</p>
<p><b>A4</b></p> <p style="text-align: right;">0 1 3</p>	<p><b>B4</b></p> <p style="text-align: right;">0 1 3</p>	<p><b>C4</b></p> <p style="text-align: right;">0 1 3</p>	<p><b>D4</b></p> <p style="text-align: right;">0 1 3</p>

BONUS 3

BONUS 3

BONUS 3

BONUS 3

A TOTAL /15

B TOTAL /15

C TOTAL /15

D TOTAL /15

Circle the mark awarded for each question and cross out the others.  
 At the end of the round, either circle the bonus mark or cross it out.

FINAL SCORE /60