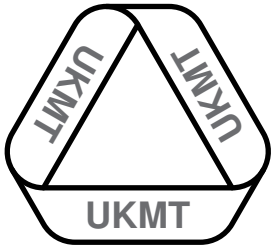


TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

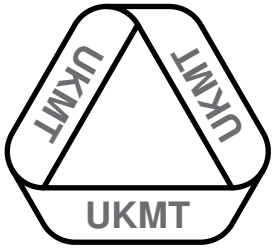
RELAY

A1

Every two minutes my dad's old pocket watch gains 5 seconds.

How many minutes will the watch gain in twenty-four hours?

ANSWER: minutes



TEAM MATHS CHALLENGE 2017

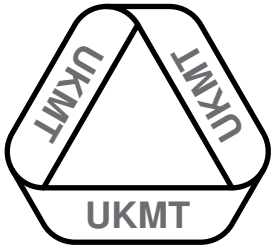
NATIONAL FINAL

RELAY

A2

What is the smallest number that is divisible by every integer from 1 to 10 inclusive?

ANSWER:



TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

RELAY

A3

16	17	18	19
26	27	28	29
36	37	38	39
46	47	48	49

Multiply the only cube in the grid by the sum of the triangular numbers in the grid.

Write down your answer in the form n^3, where n is an integer.

ANSWER:

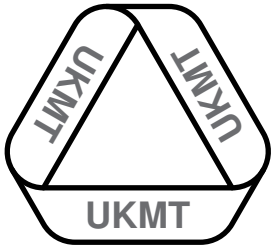
A4

An official document needs the date to be written in the form dd/mm/yyyy.

So 1 December this year is 01/12/2017.

When today's date, 19 June, is written like this, what is the mean of the digits?

ANSWER:



TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

RELAY

A5

How many of these statements are true?

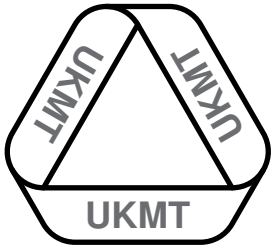
(i) There is only one Fibonacci number between 20 and 30.

(ii) A litre is a cubic decimetre.

(iii) Twelve is a multiple of thirty-six.

(iv) A set of numbers cannot have the same mean as its median.

ANSWER:



TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

RELAY

A6

The Television Licence costs £12 per month. Of this, £2.33 is spent on radio, £8.00 on television, £0.60 on on-line services and £1.07 on miscellaneous charges.

When this information is represented by a pie chart, what is the angle of the sector for radio to the nearest degree?

ANSWER: ____ °

Team Maths Challenge 2017

National Final

Relay

Ann, Phil and Sue are given a box of twenty-five chocolates to share.

Ann eats one every day, Phil eats one every alternate day and Sue eats one every third day.

They all have their first chocolate on 1 June.

On what date in June is the box emptied?

Answer:

A8

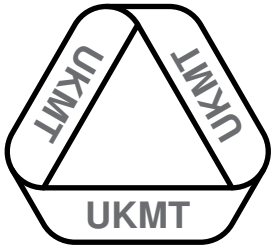
The digits 1, 3, 5 may be placed in any three consecutive boxes as indicated in the diagram.

For example 15^3 or 5^{13}.

What is the largest number that can be formed in this way?

Leave your answer in index form.

ANSWER:



Team Maths Challenge 2017

National Final

Relay

A9

The sequence 1, 3, . . . , is formed by applying the following to each term, to create the next term:

Change the sign, multiply by two, add five.

What is the range of the first seven terms of the sequence?

Answer:

TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

RELAY

Four cuboids have dimensions in cm, as follows:

$$2 \times 3 \times 3, \quad 3 \times 5 \times 2, \quad 5 \times 3 \times 6, \quad 6 \times 2 \times 5$$

Two of these cuboids are selected and glued together on identical faces to make a new cuboid.

What is the longest edge length of all possible cuboids so formed?

ANSWER: cm

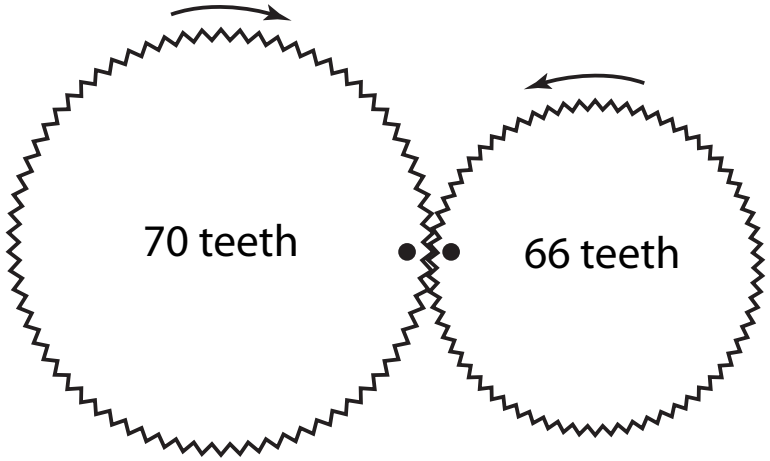
A11

TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

RELAY

Two gear wheels mesh. Initially the marks on the wheels are perfectly aligned. The large wheel completes one revolution in 20 seconds.

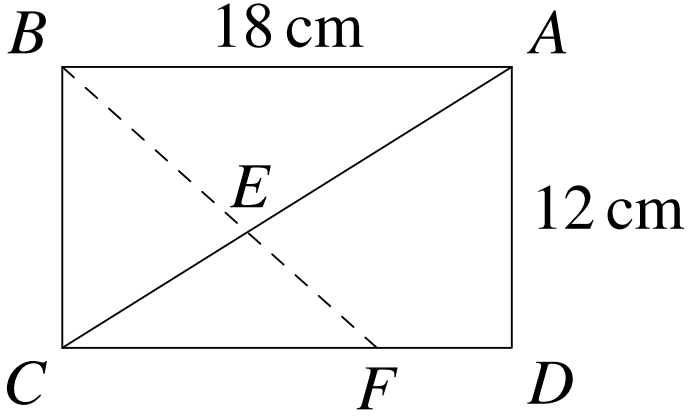


After how many minutes are the two marks again perfectly aligned?

ANSWER: _____ minutes

A12

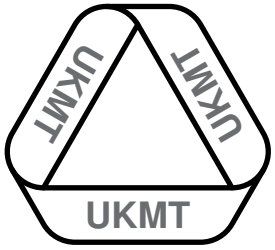
A rectangular sheet of paper $ABCD$, measuring 18 cm by 12 cm, is folded so that the edge BC exactly coincides with the edge BA.



The fold line, shown in the diagram as a dotted line, crosses the diagonal at E.

What is the area of the triangle FEC?

ANSWER: ..... cm^2



TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

RELAY

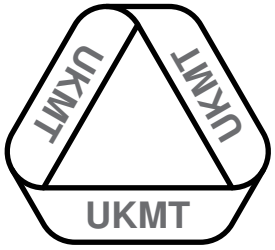
A13

A journey proceeds $A \to B \to C \to D$ in straight lines, where:

- A has coordinates $(-3, 2)$;
- B has coordinates $(1, 5)$;
- C has coordinates $(7, -3)$;
- D has coordinates $(2, 9)$.

What is the total distance covered?

ANSWER: _____ units



TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

RELAY

A14

A cuboid has edges whose lengths are in the ratio 1 : 3 : 5.

The volume of the cuboid is 405 cm^3.

What is the total surface area of the cuboid?

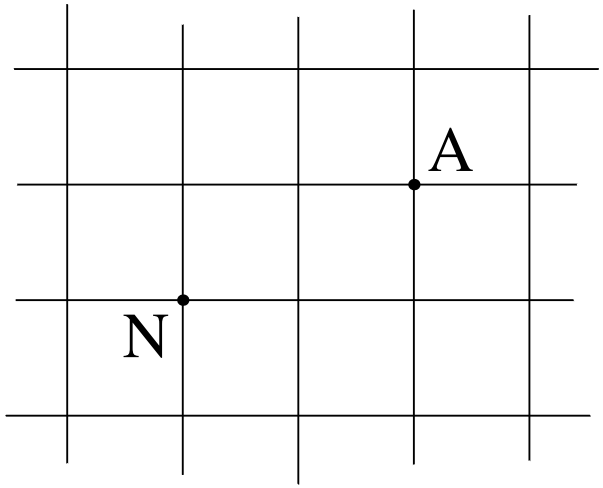
ANSWER: $\qquad\qquad$ cm^2

A15

An erratic spider has made a large web made up of 1 cm squares.

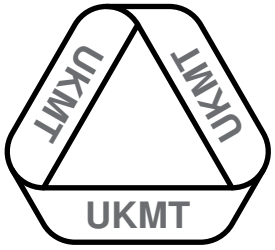
The spider can only travel along the threads of the web. For example, in going from the point N to the point A, the shortest distance the spider can travel is 3 cm.

A small part of the web



How many points, excluding N itself, are there that the spider could reach from N by travelling not more than 7 cm?

ANSWER:



TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

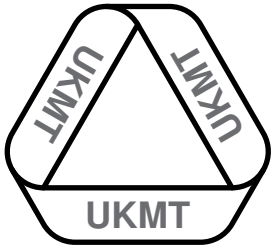
RELAY

B1

35	36	37	38
45	46	47	48
55	56	57	58
65	66	67	68

What is the sum of all the triangular numbers in this grid?

ANSWER:



TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

RELAY

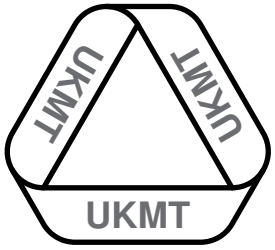
B2

In 1997 Ronnie O'Sullivan completed the fastest maximum clearance ever in snooker in just 5 minutes 20 seconds.

In 2015 the longest ever frame of snooker (between McManus and Pinches) in a professional match was played. The frame lasted 1 hour 40 minutes 24 seconds.

To the nearest whole number, how many times longer was the longest frame than the fastest maximum clearance?

ANSWER:



TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

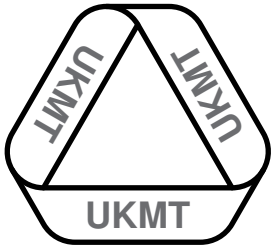
RELAY

B3

A rhombus has diagonals measuring 3.8 cm and 8.2 cm.

What is the area of the rhombus?

ANSWER: ..... cm^2



TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

RELAY

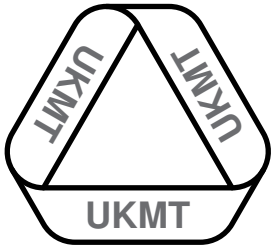
B4

The sequence 1, 3, . . . , is formed by applying the following to each term, to create the next term:

> Change the sign, add two, multiply by three.

What is the range of the first seven terms of the sequence?

ANSWER:



TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

RELAY

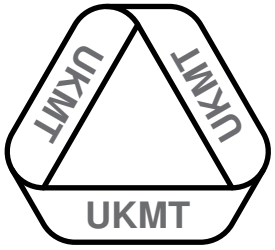
B5

Two is the smallest Fibonacci number that can be written as the sum of a square and a cube.

$$2 = 1^2 + 1^3$$

What is the next smallest Fibonacci number that can be written as the sum of a square and a cube, without using either of 1^2 or 1^3?

ANSWER:



TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

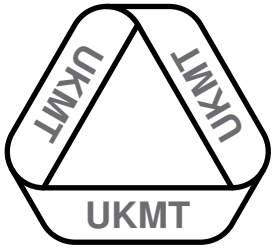
RELAY

B6

A hummingbird is found to beat its wings 170 times every nine seconds.

How many beats does it make in three minutes?

ANSWER:



TEAM MATHS CHALLENGE 2017

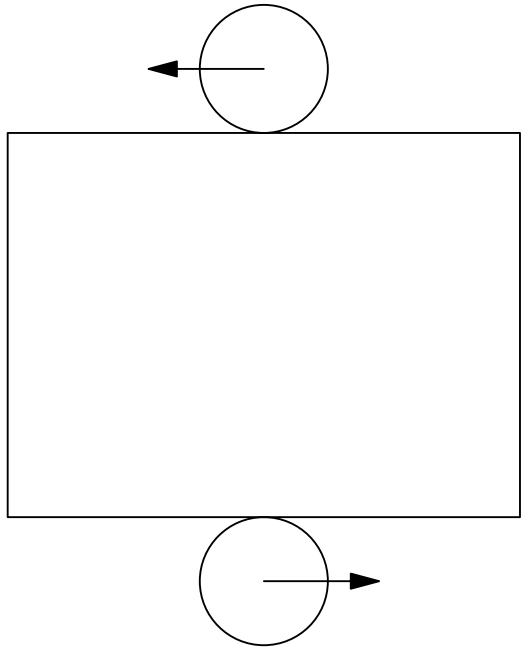
NATIONAL FINAL

RELAY

B7

Two circles of diameter 2 cm roll around a rectangle measuring 6 cm by 8 cm as shown. They start exactly at the midpoints, and both roll anticlockwise around the rectangle at the same speed.

What is the maximum distance between the centres of the circles?



ANSWER: cm

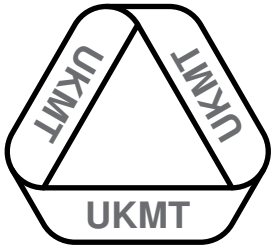
B8

A cuboid has edges whose lengths are in the ratio 2 : 3 : 5.

The volume of the cuboid is 240 cm^3.

What is the total surface area of the cuboid?

ANSWER: cm^2



TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

RELAY

B9

The Television Licence costs £15 per month. Of this, £2.50 is spent on radio, £9.47 on television, £1.40 on on-line services and £1.63 on miscellaneous charges.

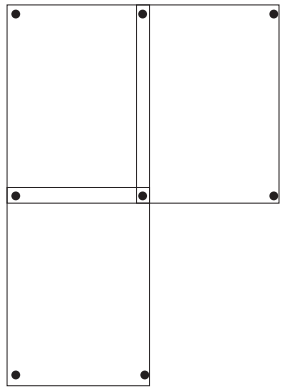
When this information is represented by a pie chart, what is the angle of the sector for on-line services to the nearest degree?

ANSWER: °

B10

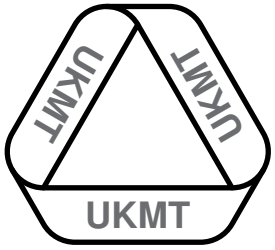
Jack is in charge of the very large maths club noticeboard and has twenty-four A4 notices to pin up, putting a pin in each corner.

By overlapping them slightly, he can use fewer pins, for example, using 8 pins to pin up 3 sheets.



Using Jack's method, what is the smallest number of pins that can be used for the twenty-four sheets?

ANSWER:



TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

RELAY

B11

Four cuboids have dimensions (in cm) as follows:

$3 \times 1 \times 1, \quad 3 \times 5 \times 1, \quad 5 \times 1 \times 4, \quad 4 \times 3 \times 5$

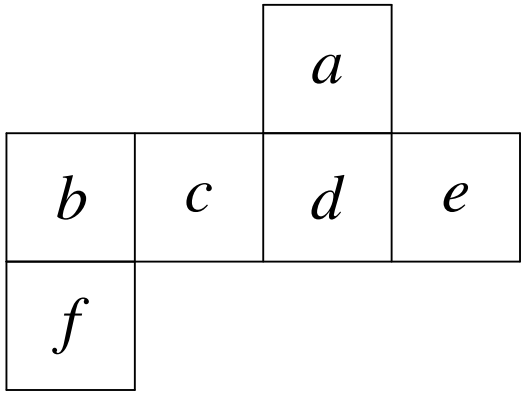
Two of these cuboids are selected and glued together on identical faces to make a new cuboid.

What is the longest edge length of all possible cuboids so formed?

ANSWER: cm

B12

An ordinary die is to be folded up from the net shown alongside.



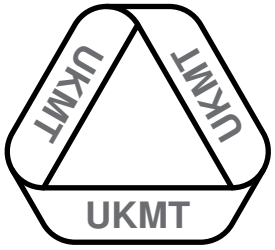
The numbers on the faces are 44, 45, 46, 47, 48, 49.

As usual, opposite faces always have the same total.

$e = 48$

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

ANSWER:



TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

RELAY

B13

A triangle ABC has a right angle at B.

$AC = 12\,\text{cm}$.

D is a point on AC.

$AD = 4\,\text{cm}$.

What is the ratio of the area of triangle ABC to the area of triangle CBD?

ANSWER:

UKMT

TEAM MATHS CHALLENGE 2017

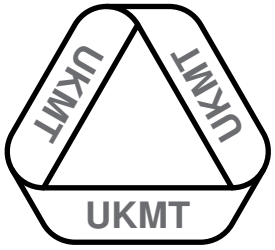
NATIONAL FINAL

RELAY

B14

What is the sum of all the numbers between 500 and 1000 that have exactly 3 factors?

ANSWER:



TEAM MATHS CHALLENGE 2017

NATIONAL FINAL

RELAY

B15

Put the following three numbers in order of decreasing size.

6^9	8^8	9^6

Leave your answer in index form.

ANSWER: