MAthematical PiE
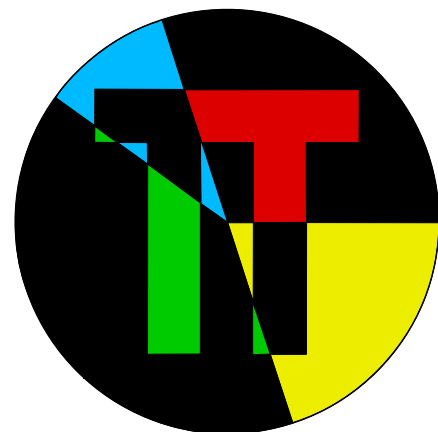
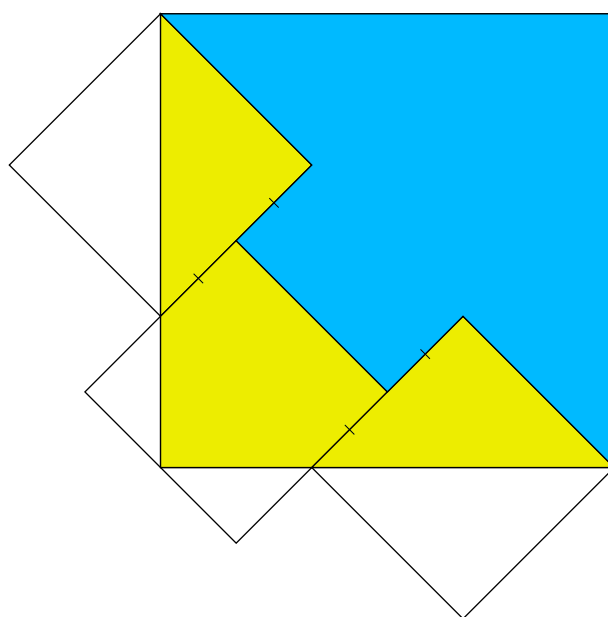## What's Left on the Right

Here are four squares, three of them congruent.

If the yellow area is 7 cm^2, what is the area of the blue arrow (the remainder of the large square)?

E.G.

Ages and Ages

My daughter and I recently celebrated our birthdays, which are only a few days apart.

After both birthdays the digits of our ages in years were the reverse of each other.

We also noticed that this had happened several times before (my daughter is an adult) and would probably happen again.

My son is two years older than my daughter but our ages will never be the reverse of each other.

Explain when and why such reversals of ages happen.

G.C.S.

The Descriptive Sequence Puzzle

0
10
1110
3110
132110
1113122110

Amarpreet writes down lines of a sequence.

He has to work out the next line using the line before it.

What is the next line Amarpreet should write?

When you've done this, search for 'Ted-Ed video Gendler Conway' to watch an interesting video about this.

Amarpreet Singh (from the website *Puzzle of the Week* : www.puzzleoftheweek.com)

Countup

Using any or all of the numbers 2, 3, 5 and 8 once only, and $+, -, \times, \div$, brackets (but not indices, so things like 2^3 aren't allowed) can you make all the totals up to 30?

Most of them are fairly straightforward but you may find some a bit tricky.

Sent in by Christopher Starr

Packaged Polygons

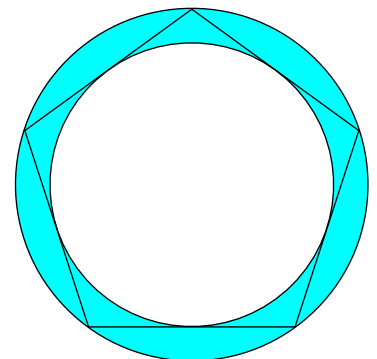Draw any regular polygon with sides measuring 2 units.

Construct the incircle and circumcircle.

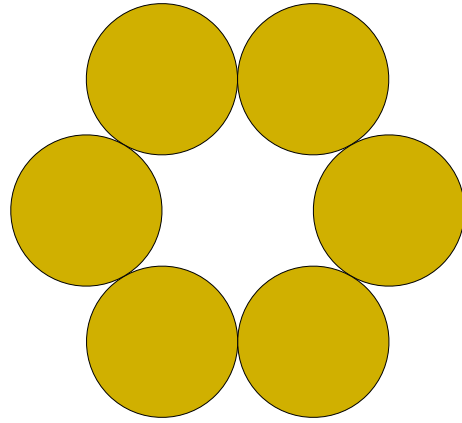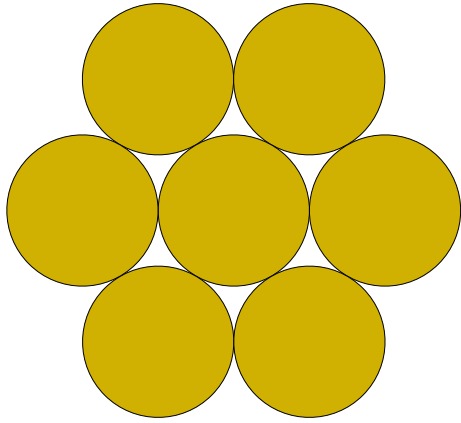It's claimed that whatever regular polygon is chosen the area between the two circles is the same.

Can this be true?

If it is, what's the explanation and what is the constant area?

H.K.M.

Six Coins

This is another puzzle by Dudeney.

You can place seven coins as in the first diagram easily enough.

But if you only have six coins, how do you arrange them as in the second diagram, without any lifting – only sliding?

<div align="right">W.R</div>

This is Awesome!

https://www.tinyurl.com/primepictures

I **love** this animation of prime factorization.

<div align="right">C.J.S</div>

Service Not Included

Hymn numbers for a church service were displayed like this.

Amelia noticed a surprising connection between the numbers.

By the end of the service she had found a similar arrangement using **all** the natural numbers from 1 to 9.

2	5	7
1	9	4
	6	3

Can you do as well as Amelia?

<div align="right">H.K.M.</div>

Three-digit Squares

Find three 3-digit square numbers which together use all the digits 1 to 9 once each.

Is your solution the only one?

<div align="right">G.J.O.J.</div>

Sudoku +

On the right is a valid sudoku solution (each row, column and 3×3 square contains each of the digits from 1 to 9).

The 1's (in bold) have an additional property (P9): they occupy a different position in each of the nine boxes.

The 2's however do not satisfy P9 (there are two boxes with a 2 in the middle of the bottom row).

Which of the digits 3 to 9 satisfy P9 here?

Construct a valid sudoku solution in which all nine digits satisfy P9.

8	5	7	4	6	**1**	3	9	2
3	6	2	9	5	8	4	**1**	7
9	**1**	4	3	7	2	6	5	8
4	9	8	7	2	6	**1**	3	5
1	3	6	8	9	5	2	7	4
7	2	5	**1**	4	3	8	6	9
6	7	9	2	**1**	4	5	8	3
2	8	**1**	5	3	9	7	4	6
5	4	3	6	8	7	9	2	**1**

G.C.S.

Visualising

I recently found this teaser in a little puzzle book: *a dog is tethered to a tree by a 10ft rope. The dog sees its food dish 15ft away, so it trots across and eats its meal. The rope doesn't break, the tree doesn't bend, so how is this possible?*

Often when I think I create pictures – especially diagrams – "in my mind's eye". It certainly helps in this case.

The author's answer was that the dish was 5ft away from the tree, on the opposite side to the dog.

I don't think that this is the only solution, and that in some circumstances it could actually be wrong. Can you visualise why?
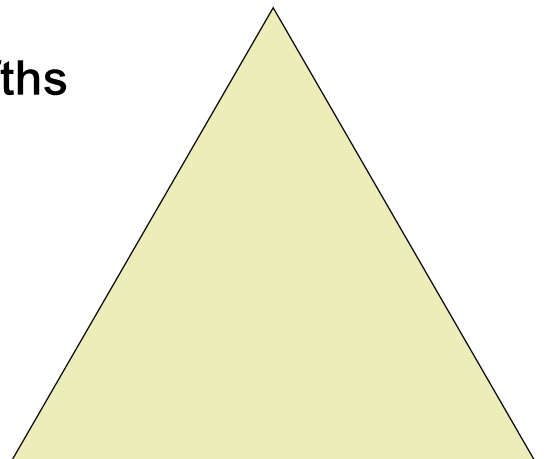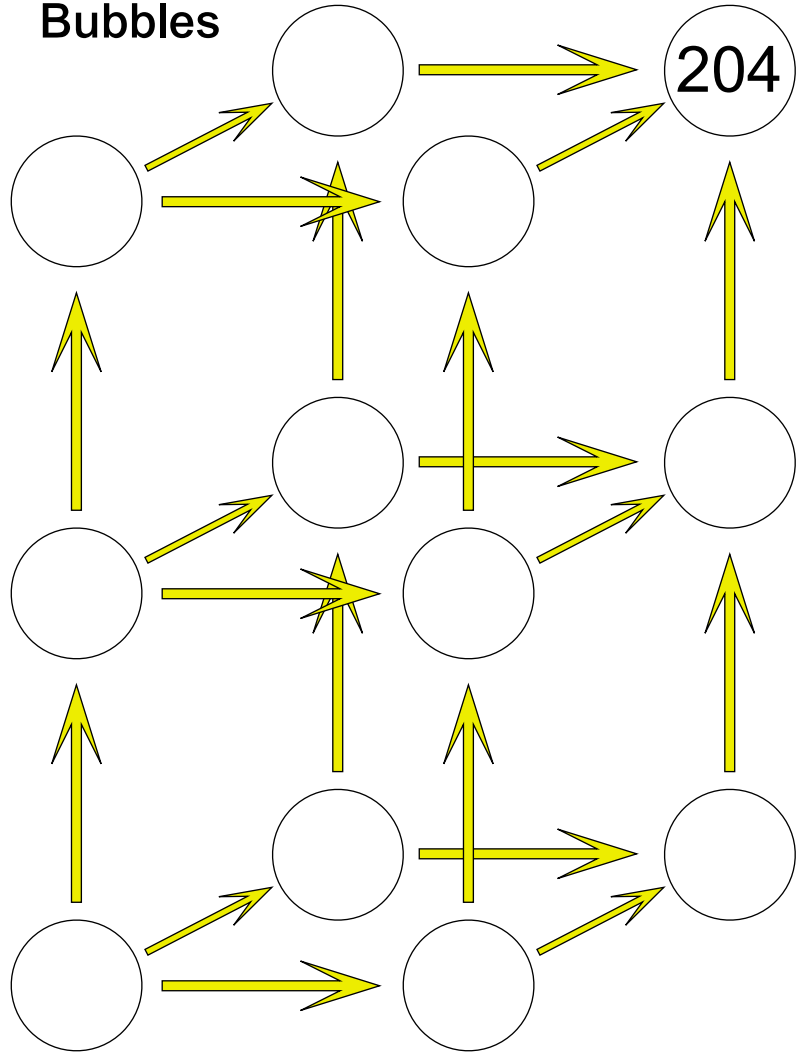
E.G.

Congruent Twelfths

It's easy to divide an equilateral triangle into congruent halves or congruent thirds.

But can you find the two ways of dividing the equilateral triangle into congruent twelfths?
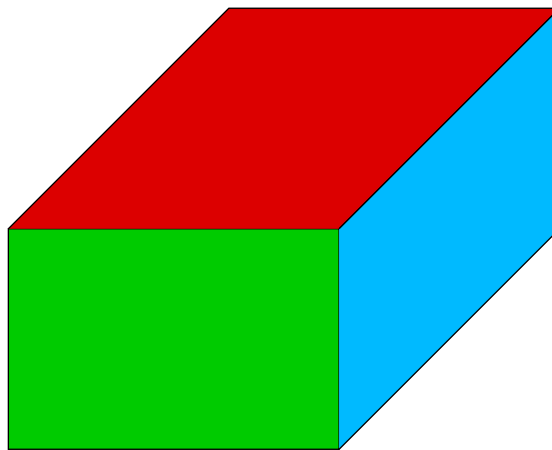
H.K.M.

Bubbles

204

Your task is to place a different number in each bubble so that whenever an arrow leaves 'bubble A' to go to 'bubble B' then B is a multiple of A.

C.J.S.

The Surface Area Puzzle

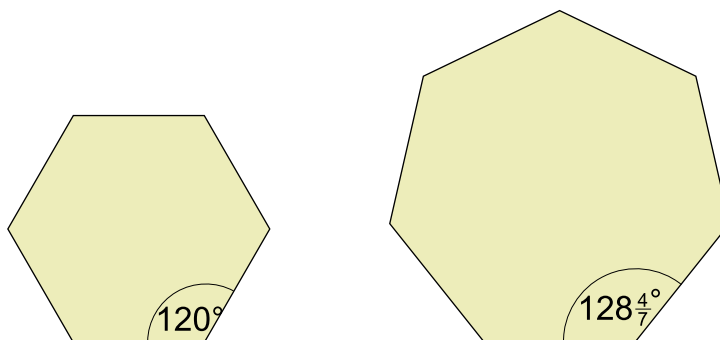Marne measures the areas of the faces of a cuboid.

She finds there are three different areas: 24 cm^2, 32 cm^2, 48 cm^2.

What is the volume of the cuboid?

Regular Polygons

How many regular polygons can you find whose angles are all whole numbers?
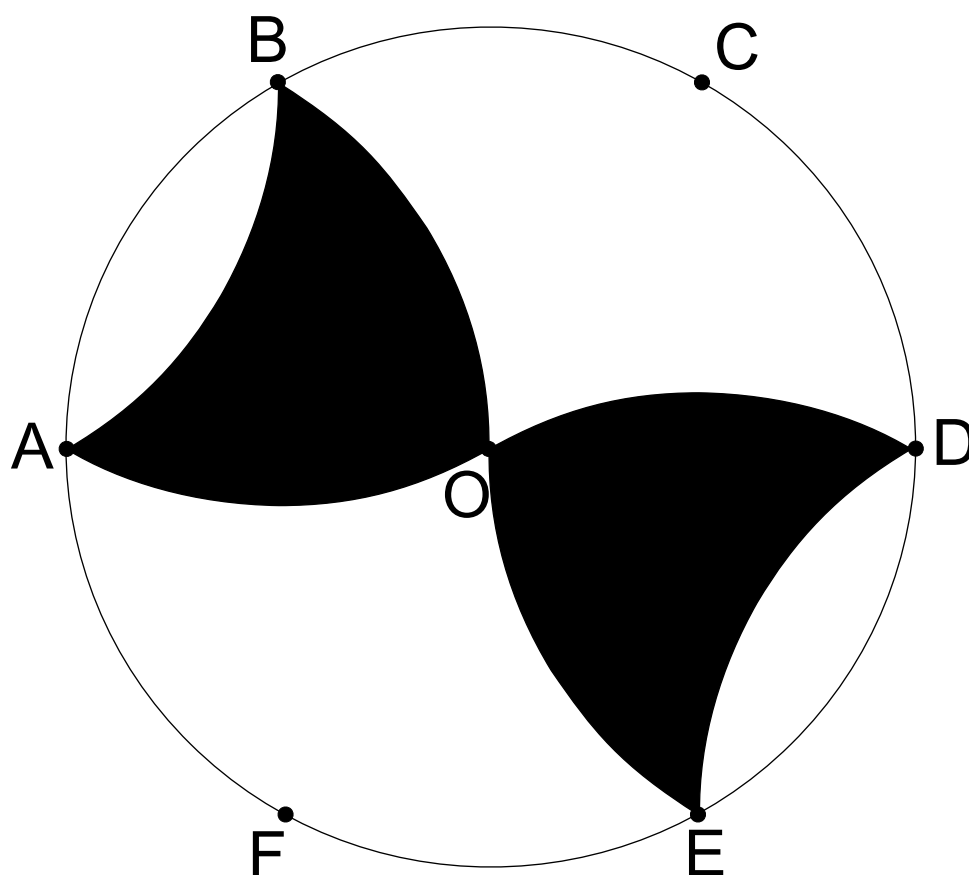

For example, the regular hexagon has an angle of 120°, so it is included, but the regular heptagon has angles of $128\frac{4}{7}°$, so it isn't included.

W.R.

Equal Arcs

Points A, B, C, D, E and F are equally spaced around a circle centre O. X and Y are marked as shown so that AXB and DYE are equilateral triangles.
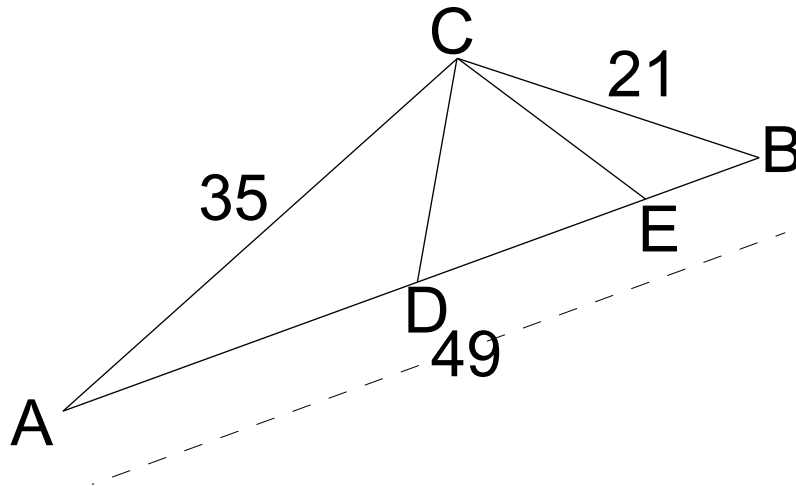

Six arcs are then drawn, all with the same radius as the circle, with centres at A, X, B, D, Y and E.

Obviously the shaded area has the same perimeter as the circle. What fraction of the circle's area is shaded?

E.G.

What Sort of Triangle?

In the diagram triangles ADC, ACB and CEB are similar.

AB is 49 cm, BC is 21 cm and CA is 35 cm.

What sort of triangle is CDE?

<div align="right">G.C.S.</div>

Polypad

The hundreds of tools, features and manipulatives available at http://polypad.org make online learning more interactive than ever before – and they are completely free.

What can you create?

<div align="right">E.S.</div>

The Yohaku Puzzle

The numbers in the green/red boxes have been hidden.

The numbers in the blue boxes are calculated by multiplying together the three numbers in that row or column.

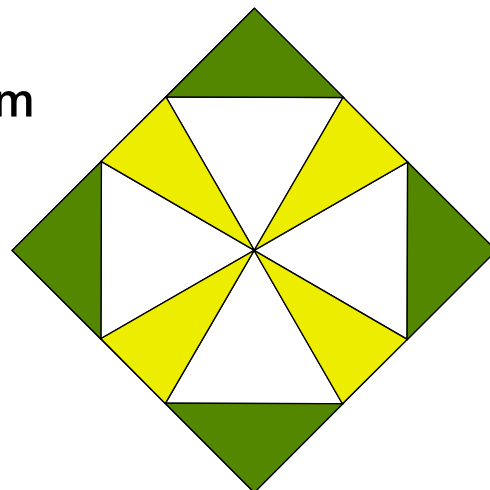Nine different whole numbers are used in the green boxes.

What number must go in the red box?

Mike Jacobs (from the website *Puzzle of the Week* : www.puzzleoftheweek.com)

Geometry Problem

Four white equilateral triangles meet in the centre of the square.

Is there more yellow or more green in the design?

W.R. (stolen from Catriona Agg in *Mathematics in School*)

On the Edge?

Each letter in the words here stands for one of the digits 0 to 9. The total of the digits is shown for each word.

Find the letter for each digit and put it into the table.

i) DARE = 23 ii) BANNER = 25 iii) BRASS = 29 iv) DRESS = 36
v) BREAD = 23 vi) REDDER = 36 vii) UNDER = 23 viii) BASIS =30
ix) ROUND = 16 x) SEARED = 40

0	1	2	3	4	5	6	7	8	9

E.G.