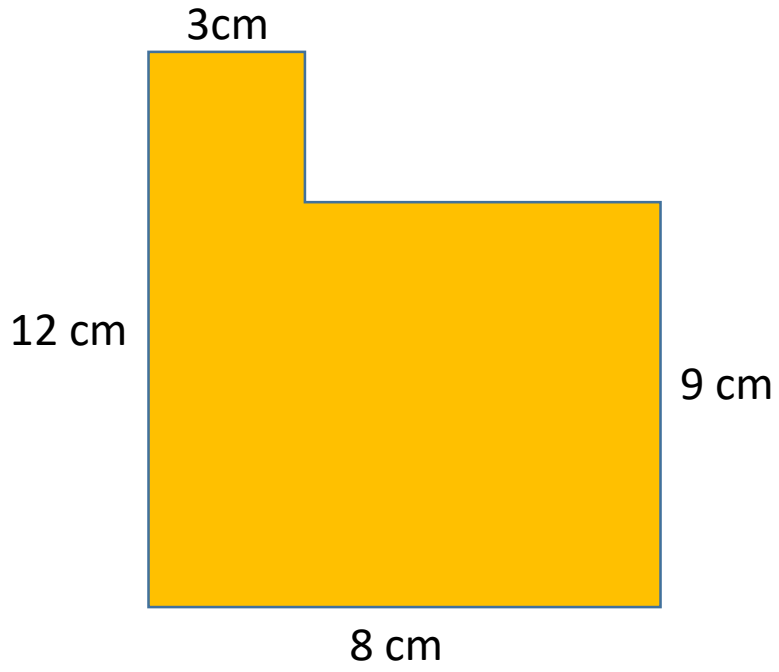
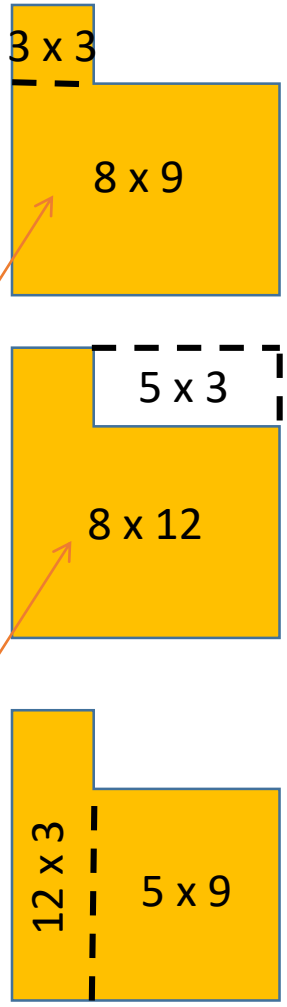
Here is a compound shape. It's area is 81 cm^2





Here are three explanations. Are any of them correct?

Alice thinks (8 x 9) + (3 x 3) = 81 Yes!

Brian thinks 9 x 9 = 81 No! That's just a guess!

Cristina thinks (8 x 12) – (5 x 3) = 81 Yes!

David thinks (12 x 3) + (5 x 9) = 81 Yes!

In the 13th Century, a Chinese mathematician called Yang Hui wrote down these arrangments of numbers which are called “magic squares”. They are very clever indeed but can you work out why?

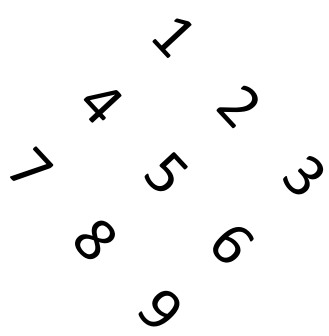
4	9	2
3	5	7
8	1	6

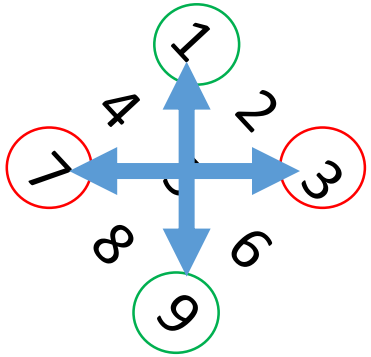
The rows, columns and diagonals all add up to 15

16	2	3	13
5	11	10	8
9	7	6	12
4	14	15	1

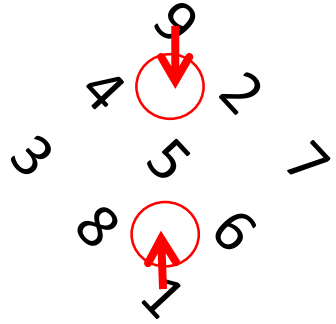
The rows, columns and diagonals all add up to 34

The next slide shows how to make these magic squares!





Swap opposite corners



Insert the 9 and the 1 into their rows and make it all look neat!

4	9	2
3	5	7
8	1	6

The rows, columns and diagonals all add up to 15

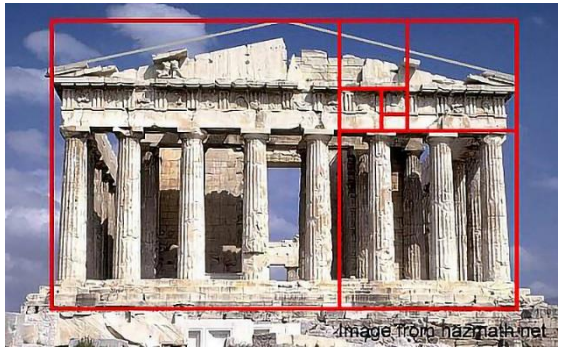
16	2	3	13
5	11	10	8
9	7	6	12
4	14	15	1

The rows, columns and diagonals all add up to 34

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

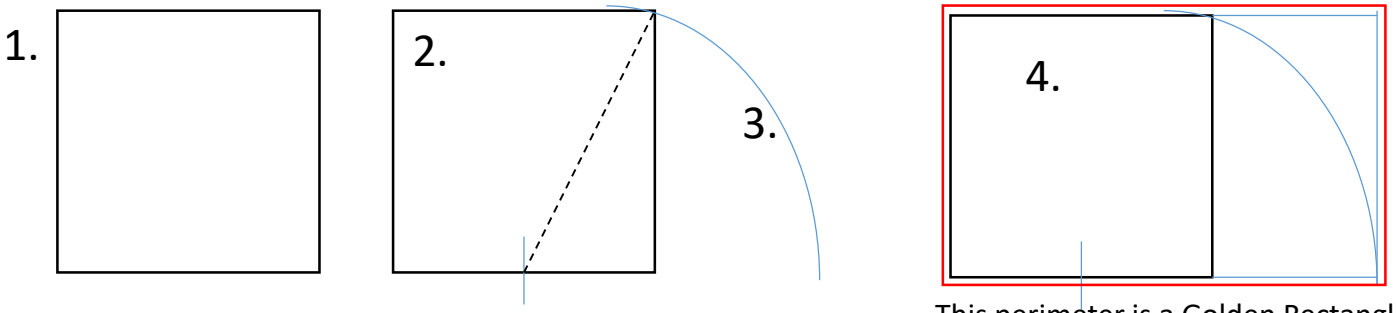
Here, write out the numbers 1 – 16 and swap over the numbers along each diagonal – look carefully, it's pretty cool how it works!

Another famous bit of mathematics is something called the Golden Ratio. If you have a rectangle where one side is 1.618 times longer than the other then it has proportions which the human eye finds very appealing and which often appears in architecture, art and nature.



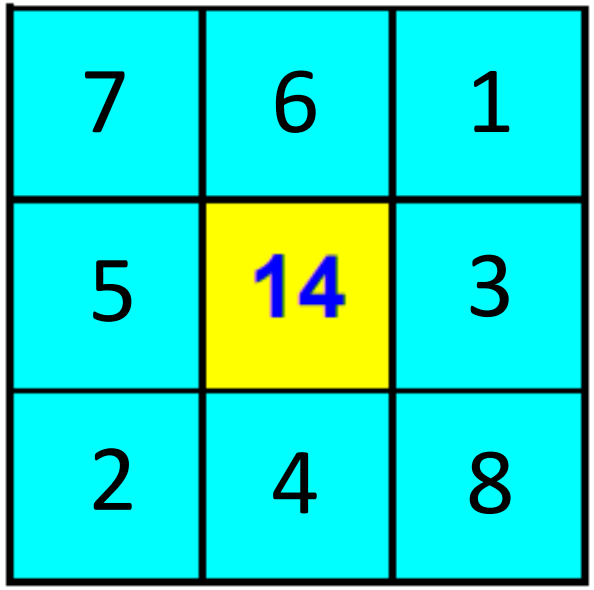
How to draw a Golden Rectangle:

1. Draw a square
2. Mark off halfway along the base.
3. Set the compass at the half way point and draw an arc from the top corner of the square down to be level with the bottom of the square.



This perimeter is a Golden Rectangle

4. Extend the bottom of the square to meet the arc.
5. Complete the rectangle.
6. Where can might see Golden Rectangles in the World around us! Find 3 examples!
7. What is the name given to the number 1.618 – it is a Greek letter.



Can you put the numbers 1 to 8 in each of the squares so that each side adds up to the middle number?

Well done to Oliver for working this out!

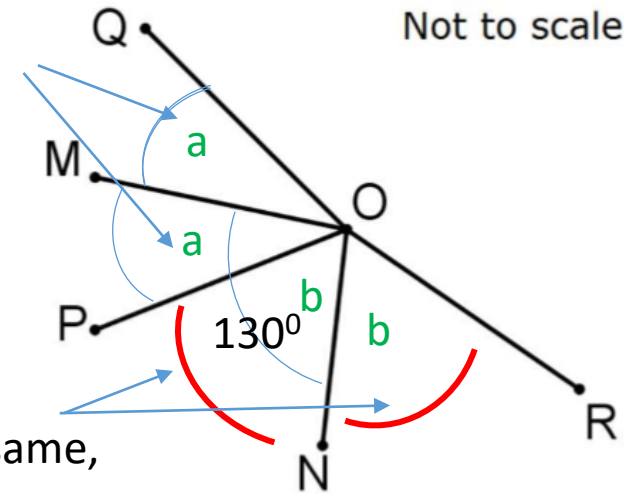
Angular reflection

In the diagram, $\angle MON = 130°$. The reflection of OP in OM is OQ and the reflection of OP in ON is OR.

What is the size of $\angle QOR$?

Means these 2 angles are the same, both called “a”.

Means these 2 angles are the same, both called “b”.



So, a + b = 130°. All the angles together = a + a + b + b or 2a + 2b which means double a + b.
If a + b = 130° then all the angles together = 260°. So, QOR = 360° – 260° = 100°

This problem came from a great website called NRICH Maths: https://nrich.maths.org/7581