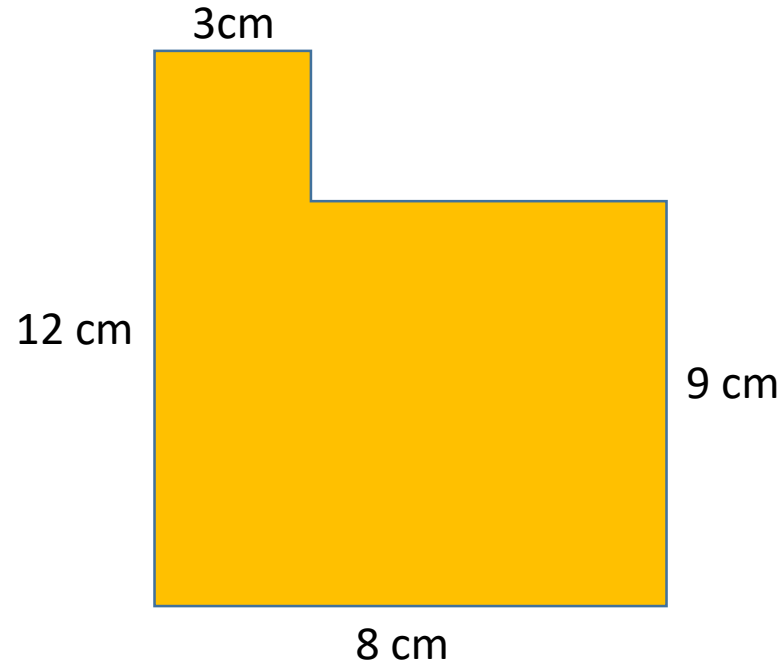


Here is a compound shape. It's area is  $81 \text{ cm}^2$



*Here are three explanations. Are any of them correct?*

Alice thinks  $(8 \times 9) + (3 \times 3) = 81$

Brian thinks  $9 \times 9 = 81$

Cristina thinks  $(8 \times 12) - (5 \times 3) = 81$

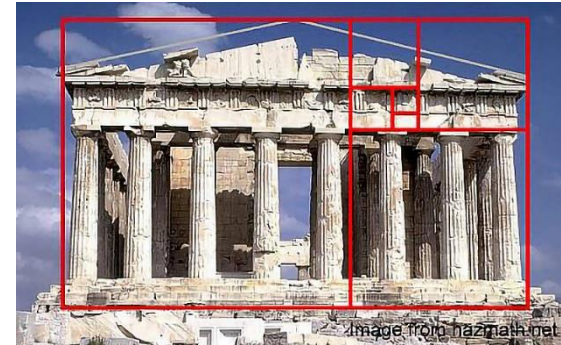
David thinks  $(12 \times 3) + (5 \times 9) = 81$

In the 13<sup>th</sup> Century, a Chinese mathematician called Yang Hui wrote down these arrangements 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

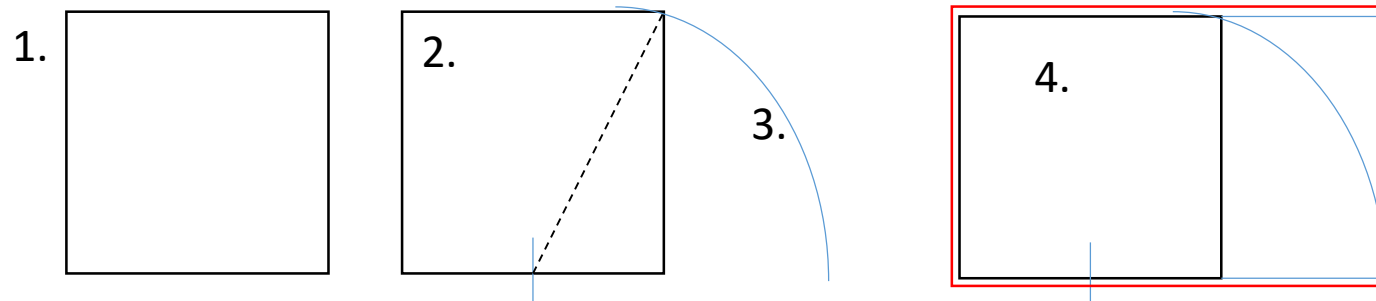
16	2	3	13
5	11	10	8
9	7	6	12
4	14	15	1

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.



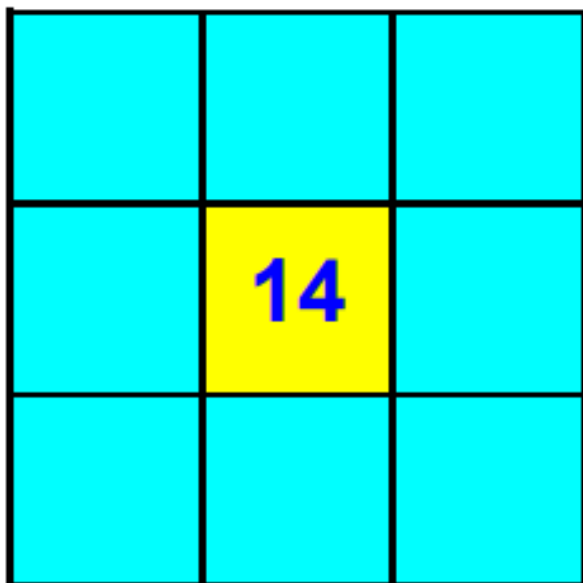
How to draw a Golden Rectangle:

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 you 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.

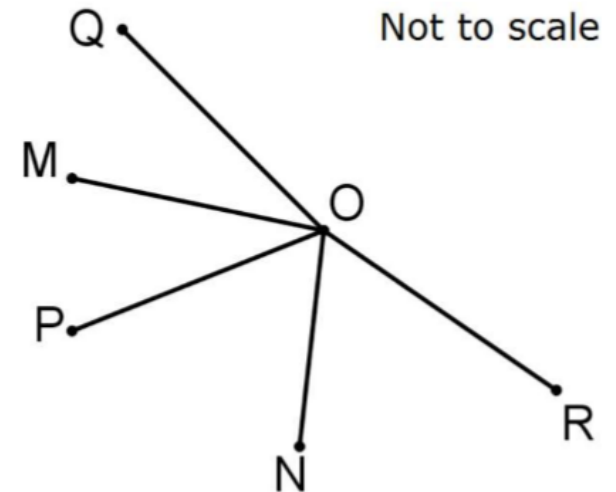


Can you put the numbers 1 to 8 in each of the squares so that each side adds up to the middle number?

### Angular reflection

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

What is the size of  $\angle QOR$ ?



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