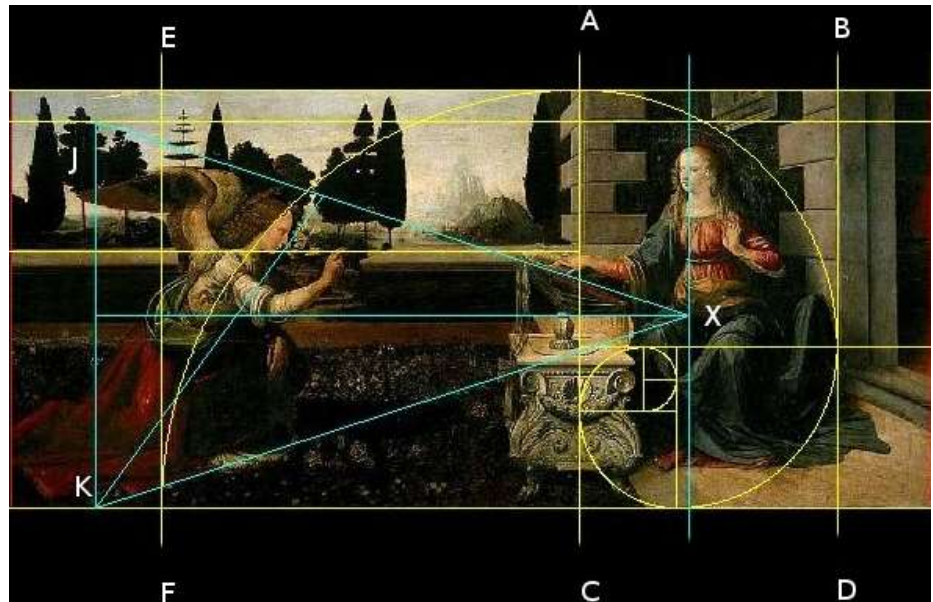# Golden section laboratory

"Annunciazione" – Leonardo da Vinci (1472-1475) Many painters and sculptors had used **golden proportions** in their paintings: <u>The ratio between the lengths of the sides of a golden rectangle</u>. In the picture, the rectangle ABCD is golden, also EBFD.

The Golden Section (or golden ratio) also appears in all forms of nature and science, such as:**<u>Sunflower seeds</u>**: The seeds are often produced at the center and migrate outward to fill the space. **<u>Pinecones</u>**: The spiral pattern of the seed pods spiral upward in opposite directions. Also many **<u>shells</u>**, including snail shells and nautilus shells, are perfect examples of the **<u>Golden spiral</u>**.
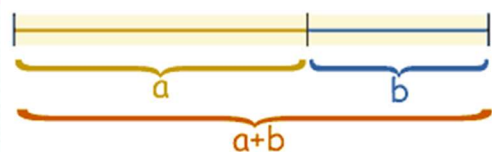
$$\frac{a}{b} = \frac{a+b}{a} = 1.618\ldots = \varphi$$
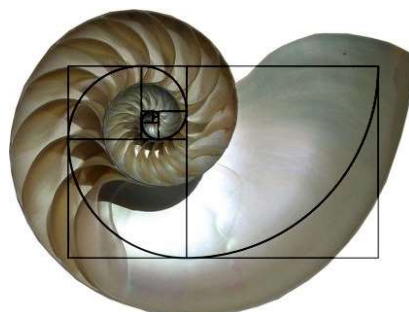
NOW, TRY TO DRAW A GOLDEN SPIRAL!

You already have a "golden rectangangle". Now, follow the instructions here below to go on!
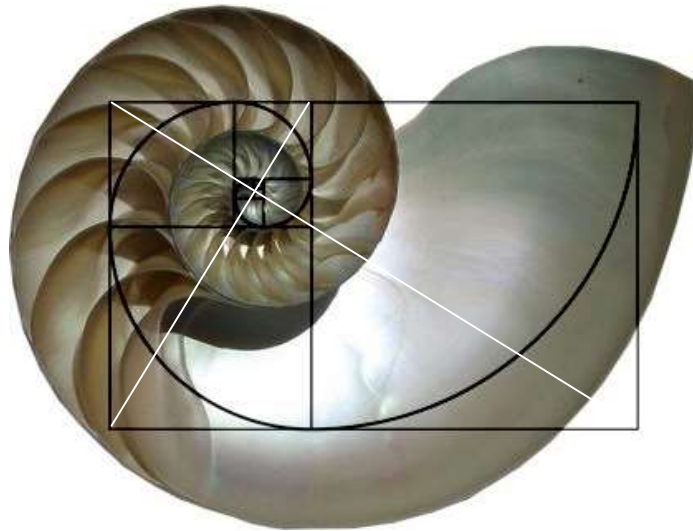
1) Subdivide the rectangle in a square (on the right) and in a golden rectangle (on the left).
2) Draw an arc of circumference, which has the center in a vertex of the square (on the left-low side).
3) Subdivide the small rectangle again into a square (on the up-side) and a golden rectangle (down-side).
4) Draw a circumferential arc in the square.
5) Continue drawing until you can.
6) Finally draw the diagonals of the two larger rectangles. If you have carefully executed your design, the intersection of the diagonals is in the most internal rectangle.

Gaio Giulio Cesare

Founder of the Roman Empire, **Gaio Giulio Cesare** (Rome, July 100 BC –44 BC) was a military, consul, dictator, maximum pontiff, orator and roman writer. He used to communicate by encrypted messages during wars.

To encrypt a message, Giulio Cesare just used a rule in which each letter is replaced with the one who is three steps forward in the alphabet.
The last three letters X, Y, Z, are replaced with A, B, and C.
We can call this rule with ROT 3, because alphabet is rotated by three positions.

1) Imagine to be the one who has to encrypt an important message for your city fate.
You have to use the Cesare's rule to encode the following message:
"Tomorrow, enemies will attack from WEST"

alphabet	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
encrypted																										

....
....
....

2) By using the rule ROT 3, try to encode the following message

Suhihuluhl hvvhuh lo sulpr wud frvwrur slxwwrvwr fkh lo vhfrqgr d urpd

alphabet																										
encrypted	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C

....
....
....

Who is the murderer?

Write the corresponding letter to the right position of each number on the line.

C R   T   A   K A D U   N I   N G   D

-1   0   1
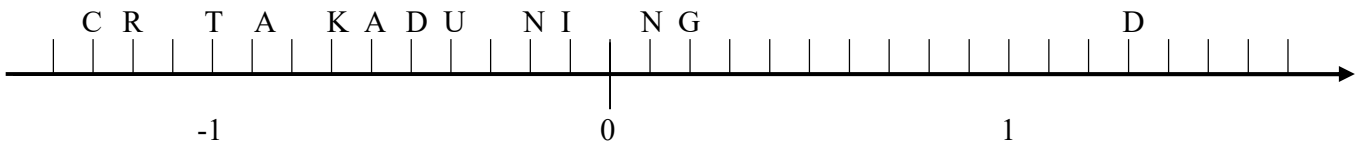
0,2	------
-0,4	------
-0,9	------
-1,2	------
1,3	------
-0,1	------
-0,6	------
0,1	------

Encode the clue using the Arabic alphabet.

What was the reason of the murder?   _ _ _ _ _

(write here the word MONEY but with the Arabic Alphabet)

Remember: in Arabic you write from right to left and each letter changes according its position in the word.

Name	Initial	Medial	Final	Separate	Pronunciation
alif*	ا	ل	ل	ا	see opposite
baa'	بـ	ـبـ	ـب	ب	b
taa'	تـ	ـتـ	ـت	ت	t
thaa'	ثـ	ـثـ	ـث	ث	th
jiim	جـ	ـجـ	ـج	ج	j
Haa'	حـ	ـحـ	ـح	ح	H
khaa'	خـ	ـخـ	ـخ	خ	kh
daal*	د	ـد	ـد	د	d
dhaal*	ذ	ـذ	ـذ	ذ	dh
raa'*	ر	ـر	ـر	ر	r
zaay*	ز	ـز	ـز	ز	z
siin	سـ	ـسـ	ـس	س	s
shiin	شـ	ـشـ	ـش	ش	sh
Saad	صـ	ـصـ	ـص	ص	S
Daad	ضـ	ـضـ	ـض	ض	D
Taa'	طـ	ـطـ	ـط	ط	T
DHaa'	ظـ	ـظـ	ـظ	ظ	DH
:ain	عـ	ـعـ	ـع	ع	:
ghain	غـ	ـغـ	ـغ	غ	gh
faa'	فـ	ـفـ	ـف	ف	f
qaaf	قـ	ـقـ	ـق	ق	g
kaaf	كـ	ـكـ	ـك	ك	k
laam	لـ	ـلـ	ـل	ل	l
miim	مـ	ـمـ	ـم	م	m
nuun	نـ	ـنـ	ـن	ن	n
haa'	هـ	ـهـ	ـه	ه	h
waaw	و	ـو	ـو	و	w
yaa'	يـ	ـيـ	ـي	ي	y
on alif	أ	ـأ	ـأ	أ	

Encode the clue using the Greek alphabet.

Where did the murder occur?

Κ	ω	λ	υ	μ	β	ή	ϑ	ρ	ά

Γ	α	ρ	δ	η	ν

A α	B β	Γ γ	Δ δ	E ε	Z ζ	H η	Θ θ
άλφα	βήτα	γάμμα	δέλτα	έψιλον	ζήτα	ήτα	θήτα
alpha	beta	gamma	delta	epsilon	zeta	eta	theta
a	b	g/y	d	ē	z	ē	th
[a]	[v]	[ɣ~j/ŋ~ɲ]	[ð]	[e]	[z]	[i]	[θ]

I ι	K κ	Λ λ	M μ	N ν	Ξ ξ	O o	Π π
ιώτα	κάππα	λάμδα	μυ	νυ	ξι	όμικρον	πι
iota	kappa	lambda	mu	nu	xi	omikron	pi
i	k	l	m	n	ks/x	o	p
[i/j/ɲ]	[k~c]	[l]	[m]	[n]	[ks]	[o]	[p]

P ρ	Σ σ/ς	T τ	Υ υ	Φ φ	X χ	Ψ ψ	Ω ω
ρώ	σίγμα	ταυ	ύψιλον	φι	χι	ψι	ωμέγα
rho	sigma	tau	upsilion	phi	hi	psi	omega
r/rh	s	t	u/y	ph	kh/ch	ps	ō
[r]	[s~z]	[t]	[i]	[f]	[x~ç]	[ps]	[o]

SAMBUCA'S TOUR

To visit the historic center of Sambuca di Sicilia, a visitor starts the journey from the Institute "Fra Felice da Sambuca" (School).
Walking the first stop at the Municipal Theater "L'Idea" with a distance of 286 m; how many meters the visitor will walk in total if the next steps are:

First step	School "Fra Felice da Sambuca	Theater "L'Idea"	286 m
Second step	Theater "L'Idea"	Museum "Sylvie Clavel"	$\frac{5}{4}$ of step 1
Third step	Museum – Sylvie Clavel	Square "San Michele"	$\frac{2}{3}$ of step 2
Fourth step	Square "San Michele"	Square Calvario	$\frac{9}{8}$ of step 3
Fifth step	Square Calvario	Courts Saraceni	$\frac{5}{6}$ of step 4
Sixth step	Courts Saraceni	Palace Panitteri	$\frac{12}{11}$ of step 5

First step	286 meters
Second step	(_ _ _ : _) x _ = ……….. meters
Third step	
Fourth step	
Fifth step	
Sixth step	
TOTAL	

PIAZZA ARMERINA, MOSAIC

The Villa Romana del Casale in Piazza Armerina is one of the most important exemplars of Roman residence. It is famous for an exceptional beauty of its architectonic and decorative elements and for its meticulous mosaics that made **a UNESCO World Heritage Site in 1997**.

Here below, a small area in a mosaic of "Villa del Casale", needs to be restore. This piece of mosaic has a triangolar shape, with 5 m at the base and 10 m hight.

1. How many square meters does the archaeologist have to cover by a cloth ?
2. How much will be the cloth if its cost per meter square is 11 €?


1.	2.

CATHEDRAL and DUOMO, HOW MANY SQUARE METERS?

The square in front of the Cathedral of Palermo has a isosceles trapezoid shape, and its size are: 5,5 cm; 5,5 cm; 3,2 cm e 3,5 cm, in a 1 : 2.000 scale model. Even the square in front of the Duomo of Monreale has a similar shape and its size are: 1,8 cm; 1,8 cm; 1,2 cm e 1,5 cm in the same scale model.

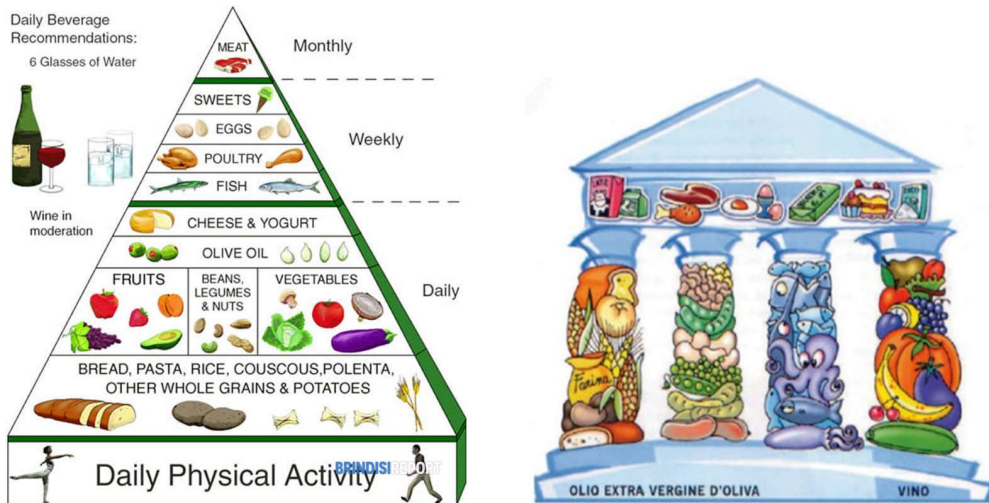Which is the difference in square meters between the two places?

Cattedrale di Palermo
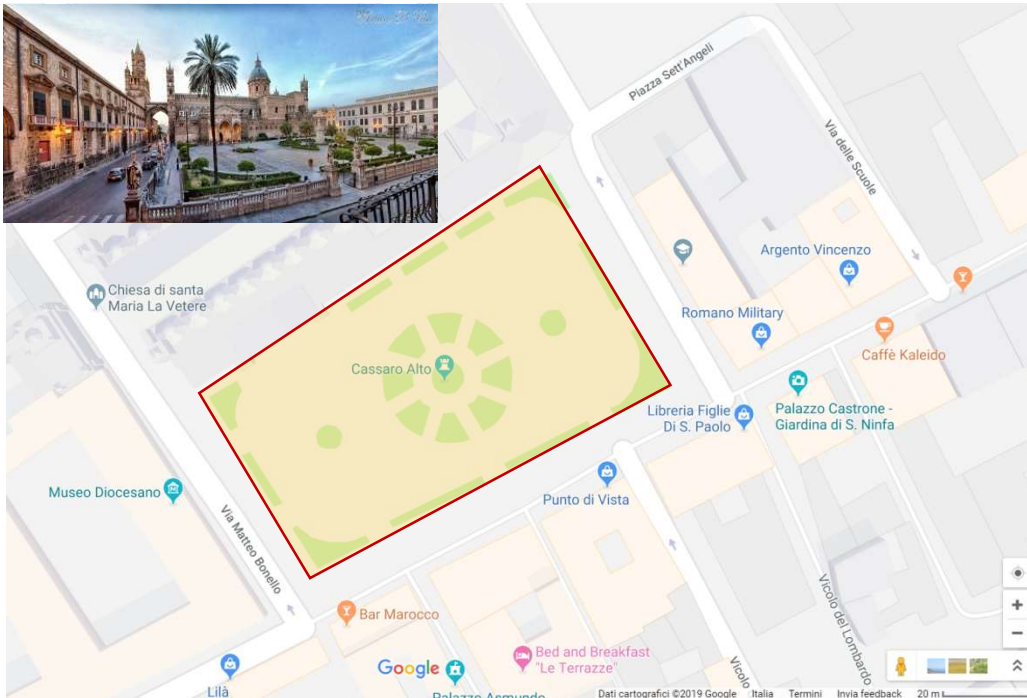
Duomo di Monreale

MEDITERRANEAN DIET

In 2010, the Mediterranean diet was declared by UNESCO as an heritage of humanity. The Mediterranean diet is the traditional diet of all the countries that overlook the Mediterranean sea, such as Italy, Greece, Spain, Portugal, Morocco and southern France.

In these countries the diet traditionally is based on fruits and vegetables, extra virgin olive oil, fish, dried fruit, bread, pasta and cereals and their derivatives, while they are consumed little meat, poultry and cheese.

The importance of this diet was discovered because this kind of diet is more health and long-lived.

Exercise

Marco for breakfast has 200 g of milk with 50 g of corn flakes, 50 g of marmalade and an apple of 100 g.

Use the table below to find the answer to the question and calculate the kilocalories developed for each food (the values written in the table correspond to 100 g of food).

How many kilocalories do Marco introduce altogether?

	QUANTITY'(g)	ENERGY(kcal)
Milk	100	61
Bread	100	276
Corn flakes	100	364
Marmalade	100	220
Apple	100	45

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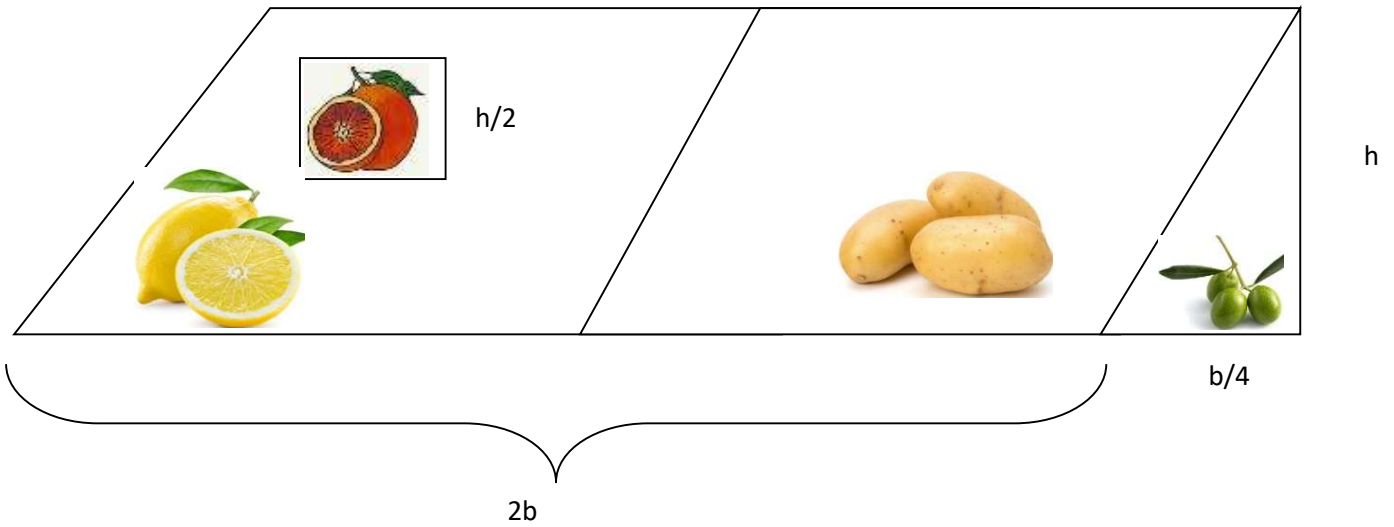
Mediterranean Areas exercise

By seeing the figure, calcolate the area of each fruit in the figure and the mach the right area

$$\frac{bh}{8}$$

$$bh$$

$$\frac{h^2}{4}$$

$$bh - \frac{h^2}{4}$$

Oranges	Potatoes	Lemons	Olives

Oranges:……………………………………………………………………………………………………

Lemons:……………………………………………………………………………………………………

Potatoes:……………………………………………………………………………………………………

Olives:……………………………………………………………………………………………………