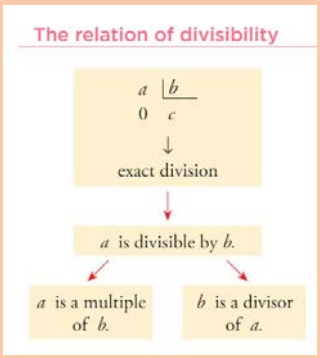
UNIT 1. DIVISIBILITY 2º ESO

HISTORY

Who was **Eratosthenes?** We are going to study some curiosities about his life:

Eratosthenes of Cyrene (276 –194 BC) was a Greek polymath: a mathematician, geographer, poet, astronomer, and music theorist. He was a man of learning, becoming the chief librarian at the Library of Alexandria. His work is comparable to what is now known as the study of geography, and he introduced some of the terminology still used today.

He is best known for being the first person to calculate the circumference of the Earth, which he did by using the extensive survey results he could access in his role at the Library. He was also the first to calculate the tilt of the Earth's axis. He created the first global projection of the world, incorporating parallels and meridians based on the available geographic knowledge of his era. In number theory, he introduced the sieve of Eratosthenes, an efficient method of identifying prime numbers.



Look at the example, then copy into your notebook and complete.

- **20 : 5 = 4**
  20 : 4 = 5 → **20 is a multiple of 4 and 5. 4 and 5 are divisors of 20.**

a) 12 : 4 = 3
12 : 3 = 4 → 12 is a... of 3 and 4. 3 and 4 are... of 12.

b) 30 : 5 = 6
30 : 6 = 5 → ... ...

QUESTIONS & TALK

Is … a multiple of …?
Is … divisible by …?
Is … prime or composite?

Is … a factor of ….?
Can you tell me the factors of …?
Does … go exactly into …?
Does … divide …?

VOCABULARY & EXPRESSIONS

- **Divisor:** divisor
- **Multiple:** múltiplo
- **Divisibility criteria:** criterios de divisibilidad
- **Even digit:** cifra par
- **Odd digit:** cifra impar
- **Prime number:** número primo
- **Composite number:** número compuesto
- **Factor:** factor
- **Prime factor decomposition:** descomposición en factores primos
- **Greatest common divisor (GCD):** Máximo común divisor (MCD)
- **Least common multiple (LCM):** Mínimo común múltiplo (mcm)

THE SIEVE OF ERATOSTHENES

To find all the prime numbers less than 100 you can use The Sieve of Eratosthenes. See how it works.

1.- Write every number from 1 to 100 on a square.

2.- Number 1 is neither prime nor composite. Cross out it.

3.- Number 2 is prime. Now cross out every even number after 2 (don't cross out 2 itself).

4.- Number 3 is prime. Cross out every multiple of 3 (don't cross out 3 itself).

5.- Number 5 is prime. Cross out every multiple of 5 (don't cross out 5 itself).

6.- Number 7 is prime. Cross out every multiple of 7 (don't cross out 7 itself).

7.- Now, go on by yourself.

When you finish, all the numbers not crossed out are the prime numbers less than 100. Write them.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

DIVISIBILITY PROBLEM

A certain bus stop is the start of 2 different lines, A and B, that both start their journeys at 7am.

Line A runs a service every 24 minutes, and line B every 36 minutes.

At what time will both lines coincide with each other at the bus stop?

DATA	OPERATIONS
7 am	LCM (24, 36) = $2^3 \cdot 3^2 = 72\ minutes$
Line A 24 min	$24 = 2^3 \cdot 3$
Line B 36 min	$36 = 2^2 \cdot 3^2$

SOLUTION

These bus lines coincide with each other at 8.12 am.

EGYPTIAN STYLE DIVISIONS

Before the decimal numeral system existed, dividing wasn't so easy! Look, for example, at how Egyptians calculated 380 divided by 20.

They started by writing two columns:

— The first column had consecutive duplications of the divisor 20, without exceeding 380.

20	1
40	2
80	4
160	8
320	16
380	19

— The second column had consecutive duplications of 1.

— From the first column, they took the necessary numbers to get to 380 → 20 + 40 + 320 = 380.

— Then, they took the corresponding numbers from the second column → 1 + 2 + 16 = 19.

— That result from the second column is the result of the division (the quotient): 380 : 20 = 19

1. Using the Egyptian system, divide 414 by 18.