1.4 Lesson 4 : prime poems

Vocabulary		
Sets of numbers	counting numbers	$\mathbb{N}^* = \{1,\ 2,\ 3, \ldots\}$
	whole numbers	$\mathbb{N}^* = \{0,\ 1,\ 2,\ 3, \ldots\}$
	even numbers	$2,\ 4,\ 6, \ldots$ can be divided exactly by two.
	odd numbers	$1,\ 3,\ 5, \ldots$ will have a remainder of 1 when divided by 2.
	integers	$\mathbb{Z} = \{\ldots -2, -1, 0, 1, 2, 3, \ldots\}$
	$\mathbb{D}$ and $\mathbb{R}$	set of decimal numbers and set of real numbers
	irrational numbers	like π (pie), $\sqrt{2}$. They can't be written as ratios of integers.

Whole numbers are all non-negative integers :

- positive number means *"nombre strictement positif"*
- non-negative number means *"nombre positif ou nul"*

■ **Exemple 1.2**

$12 = 4 \times 3 = 2^2 \times 3$ is a multiple of 4 and a multiple of 3.

1. 4, 2 and 3 are factors of 12.
2. 2 and 3 are prime factors of 12.

Exercise 14

Fill the blanks appropriately:

1. 7 (A) (is) (B) (is not) a prime factor of 27.
2. 2 and 7 (A) (are) (B) (are not) prime factor of of 14.
3. Prime factors of 20 are .....
4. 4, 9 and 16 are ..... numbers.
   2, 4, 12, 18 are ..... numbers.
   1, 3, 15, 33 are ..... numbers
   -5, -10 and -1 are ..... numbers.
   -5, 0 and -3 are ..... numbers.
   2, 7 and 11 are ..... numbers.
5. 2, 3, 5 and 7 are ..... numbers less than 10.
6. The prime numbers between 30 and 40 are .....
7. The square root of 36 is equal to ..... The square root of 100 is .....
   The square root of 10 is less than ..... and more than .....

The following poem was recited by Kumar, played by Kal Penn, in the movie "Harold & Kumar Escape from Guantanamo Bay" (2008).

The square root of three

I'm sure that I will always be
A lonely number like ☐
The three is all that's good and right,
Why must my three keep out of sight
Beneath the vicious square root sign,
I wish instead I were a ☐
For nine could thwart this evil trick,
with just some quick arithmetic
I know I'll never see the sun, as ☐
Such is my reality, a sad ☐

When hark! What is this I see,
Another square root of a three
As quietly co-waltzing by,
Together now we ☐
To form a number we prefer,
Rejoicing as an ☐
We break free from our mortal bonds
With the wave of magic wands
Our ☐ become unglued
Your love for me has been renewed

David Feinberg

1. If Kumar is a root three, then he is :

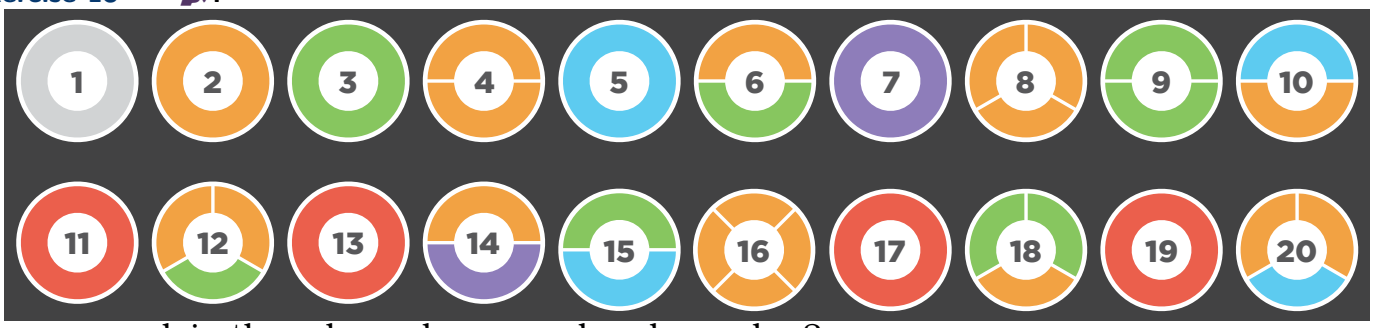
   (A) odd (B) decimal (C) rationnal (D) an irrationnal number.

2. What does irrationnal mean in a non mathematical context? Use it in a sentence.

3. What does odd mean in an non mathematical context ? What about Odd ?

4. As Kumar met another square root three, they multiply. What is so special about the outcome ?

Exercise 15 — .



Can you explain the color codes around each number?

Recall simple rules to check if a 2-digit number is prime.

General rule A whole number n is prime if it has no prime factor less or equal than $\sqrt{n}$.

Exercise 16

Check whether $n = 167$ is prime or not.

Let us watch how "Dr James Grime finds left-truncatable primes". youtu.be/azL5ehbw_24

Definition 1.1

A *left-truncatable prime* remains prime if the leading ("left") digit is successively removed.

A *right-truncatable* prime remains prime when the last ("right") digit is successively removed.

▪ Exemple 1.3

29 is not a left-truncatable prime :

29 is a prime

9 is not a prime

167 is a left-truncatable prime :

167 is a prime

67 is a prime

7 is a prime

▪ Exemple 1.4

13 is not a right-truncatable prime :

13 is a prime

1 is not a prime

239 is a right-truncatable prime :

239 is a prime

23 is a prime

2 is a prime

Exercise 17 See answers

1. Explain why 17 and 83 are not right-truncatable primes.
2. Explain why 19 and 31 are not left-truncatable primes.
3. There are 9 right-truncatable primes with 2 digits. Find all of them.
4. There are 11 left-truncatable primes with 2 digits. Find all of them.
5. Find a right-truncatable prime with 3 digits that leads with $59\cdot$.

There are 83 right-trucatable primes, the largest being 73939133.

There are 4260 left-truncatable primes, the largest being $357{,}686{,}312{,}646{,}216{,}567{,}629{,}137$.

More examples are listed in *The Online Encyclopedia of Integer Sequences* at `https://oeis.org/A024770` and `https://oeis.org/A024785`.